

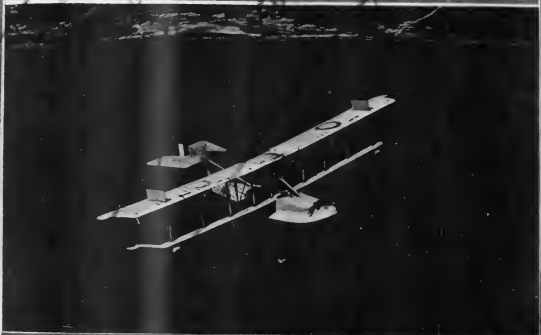
AVIATION

RECEIVED
AUG 1 1922
FIELD OFFICER'S SCHOOL
LANGLEY FIELD, VA.

AUGUST 7, 1922

Issued Weekly

PRICE 10 CENTS



U. S. Naval Scaplane Releasing a Carrier Pigeon

VOLUME XIII

Number 6

SPECIAL FEATURES

AEROMARINE ENGINE PASSES 300 H.P. NAVY TEST
REPORT ON ACCIDENT TO THE AIRSHIP ROMA
DESCRIPTION OF THE HANOVER GLIDER
DUTCH INSTRUMENT COMPETITION

Four
Dollars
a Year

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y.,
under Act of March 3, 1879.

LEARN TO FLY NOW!



FLYING is destined to become one of the foremost professions in the world. It is also destined to become one of the most profitable. But the rewards will go only to the men who get into aviation now—while the industry is yet young. These are the men who will get the good jobs, the important positions, the big salaries.

You can be one of these men. The first accuracy in training. You must learn all about airplane structure, airplane engines, and aerodynamics. You must learn how to fly—how to be a pilot.

WHERE TO LEARN

There is just one place where you can get the broadest knowledge of airplanes and the most thorough training in flying. That place is Dayton, Ohio—the birthplace of the airplane—the leading city in aviation progress.

In Dayton you will be taught mastery of the air on the great flying field of the Dayton Wright Company. You will learn flying under the supervision of expert and experienced teachers—men who have flown thousands upon thousands of miles and know exactly how to teach you what they have learned. You will use the very latest type of training planes. You will learn flying by the modified Goupert System.

As a pupil of the Dayton Wright Company you will have the opportunity of visiting McCook Field—the Engineering Division of the Army Air Service. Here you may study at first hand the designing and building of many types of military aircraft.

As a pupil of the Dayton Wright Company you will learn more than flying. You will learn the principles of standard airplane design, and many other things essential to real knowledge of commercial flying.

With Dayton Wright facilities and Dayton Wright methods of training you will gain in the shortest possible time that knowledge absolutely essential to your success in this great new profession of flying. The time to learn is now—when you can still get in on the ground floor.

WHAT TO DO FIRST

You know that flying has a limitless future. You know that you can do with the industry—if you only have the necessary knowledge. You know that the sensible place to acquire this knowledge is at the Training School for Pilots conducted by the Dayton Wright Company—a training school located in the very center of airplane knowledge and progress.

Then the first thing for you to do is to write this company for full information regarding their Training School. You can make your future what you will by learning mastery of the air. Send now for full details. There is no charge—no obligation—no reason why you should delay a moment in sending for complete free information on the course of instruction offered by the Training School for Pilots.

DAYTON WRIGHT COMPANY

DAYTON, OHIO, U. S. A.

"The birthplace of the airplane"



Widely Known and Famous

Aeromarine
BOATS

There has been firmly established throughout the country an active and intense allegiance to the AEROMARINE name and the excellence of AEROMARINE FLYING BOATS.

Underlying it and stimulating it is the wonderful record of their performance; the charm of their travel; the ease with which they handle; and lastly, the superb reliability and economy with which they serve.

We offer to discriminating buyers a limited number of the famous AEROMARINE NAVY U.S. LIBERTY ENGINE FLYING BOATS at prices as low as quality, performance and prestige will allow. Write for illustrated, descriptive pamphlet and booklet "What They Say about the Aeromarine Flying Boat Service."

Aeromarine Engineering and Sales Co.

1800 Times Building, New York

And now on the Great Lakes between Cleveland and Detroit the "Black Tailed" Flying Boats of the Aeromarine Airways are operating daily, adding more prestige to the Aeromarine name and helping America's large and its local transportation.

BOEING AIRPLANE COMPANY

Manufacturers of

EXCLUSIVELY DESIGNED

**SEAPLANES
FLYING BOATS
AIRPLANES**

**CONTRACTORS TO UNITED
STATES GOVERNMENT**

**GEORGETOWN STATION
SEATTLE WASHINGTON**

Member of the Manufacturers Aircraft Association



AUGUST 7, 1922

AVIATION

VOL. XIII. NO. 6

Member of the Audit Bureau of Circulations

CONTENTS

Editorials	147	Indianapolis Office Bldg	158
Report on Accident to the Annapolis Home	148	Cincinnati Airport	158
Aviation's Engine Power 300-hp Navy Test	150	Aircraft for Panama	155
Aerial Trespassers Encountered	150	Aircraft Appropriations, 1922-23	155
General Classification of Instruments	155	Trade Notes	159
Kansas City Airport	155	Leading Field Information	160
Description of the Hammer Glider	156	"Propulsion Efficiency vs. Performance"	160
Swiss Instrument Competition for Fog Flying	157	Army and Navy Air News	161
New York to Bristol Flight	158	Coming Aeronautical Events	163
Leading Lost Lairs	159	Foreign News	163

THE GARDNER, MOFFAT COMPANY, Inc., Publishers
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Subscription price: Four dollars per year. Single copies five cents. Canada, five dollars. Foreign, six dollars a year. Copyright 1922, by The Gardner, Moffat Company, Inc.

Issued every Monday. Forms close ten days previously. Entered as second-class matter, Nov. 22, 1910, at the Post Office at Highland, N. Y., under act of March 3, 1879.

THOMAS-MORSE AIRCRAFT CORPORATION

CONTRACTORS TO U. S. GOVERNMENT

ITHACA,



NEW YORK



Building for the Future

America needs airplanes. It may not be thoroughly awake to the need as yet, any more than the people who rode in stage coaches were conscious that they needed railroad trains, or the crews of the old wooden three-deckers felt that they needed iron-clads.

Europe, broke as it is, is making air-transportation pay and, more important still, is developing a steadily increasing number of landing fields and a constantly growing force of airmen.

The Glenn L. Martin Company has the good reputation of making the most reliable airplanes in America. Not content

with this, it is steadily pushing forward in research, engineering, and intensive development work, in the ambition not only to make the best machines, but to make them in the best scientific way.

Corporations interested in Commercial Aeronautics are invited to write—

THE GLENN L. MARTIN COMPANY

CLEVELAND

L. D. GORDON PRESIDENT
W. D. MOFFET VICE-PRESIDENT
W. I. SEARBY TREASURER
GEORGE NEWBOLD ASSISTANT MANAGER

Vol. XIII

AUGUST 7, 1932

No. 6

AVIATION

LAMARLY D'URCY EDITOR
VICTOR E. CLARK
EDWARD P. WARDEN
RALPH H. UPHAM
CONSTRUCTION EDITOR

One Year Later

One year has gone by since on July 31, 1931, the Outfitland was sunk by an airplane bomb. That "shot was heard around the world." It is significant that the General Board of the Navy has since submitted a program which calls for more rapid development of aviation, specializing in new types of planes, and for the completion of two large rigid airships, one in Germany and the other at Lakehurst. The board also recommends an increase of funds for the construction of two battle cruiser hulls into aircraft carriers in order to expedite work on the much needed type of vessel and place them in commission at the earliest possible date. This shows that the lesson of the bombing of the German warships has been learned by the Navy.

General Fanning on the other hand has just presented a plan for national defense. The accounts published make no mention of aviation, although the coast defense problem undoubtedly has been considered by him in this connection. It is to be hoped that it will not require another landing episode with coast forts as objectives to demonstrate how useless this form of protection has become against aircraft.

Compartmented Airships

It is usually assumed that a large airship must be built with several independent gas-tight compartments. For the sake of bringing out discussion on the subject we submit the question as to whether a compartmented construction is not rather undesirable under certain conditions.

When multiple gas compartments are incorporated into an airship design it is presumably for one or more of the following reasons:—

1. To permit structural elements to be distributed at various points inside the hull without crossing them through the gas.
2. To break up the head of gas when the ship is tilted to avoid a dangerous internal pressure at the high end.
3. To prevent sudden stalling of the gas from one end to the other.
4. To facilitate inflation, deflation, and other changes in the volume of the gas.
5. To provide increased safety in case of puncture or tearing of the envelope.

From a standpoint of construction and ordinary operation, it is claimed on good authority that even a large airship can now be built more efficiently without compartments than with them. This does not, however, take care of the safety item, which must be considered more closely. The question here is not whether compartments in themselves are a good thing, but whether the same weight could be put elsewhere to better advantage. For example, more weight necessarily is provided for the prompt detection and repair of small

holes consumed during flight, for an insignificant weight compared to that of a multiplicity of partitions.

In general, compartments are a detriment rather than otherwise under any conditions where a landing must be made before gas expended in the quantity in one compartment is lost. This would certainly apply to nearly any commercial operation over land. For military use the danger of serious damage is of course much greater. But here the very best safeguard is stowage, and an airship depends primarily on lightness of construction; it might be well even here to consider doing away with multiple gas compartments if any great weight could thereby be saved.

The Gordon Bennett Balloon Race

AT the time this issue appears, twenty competitors—Americans, Belgians, British, French, Indians, Spanish and Swiss—for the Gordon Bennett Balloon Cup are still "somewhere in Europe" to bring back to their respective country that much coveted trophy.

This year's contest is the clearest for the trophy given by the late James Gordon Bennett. In going over the record of the various countries in this international contest it is gratifying to note that American balloons have won the trophy four times, as against twice each for Germany and Switzerland, and once each for Belgium and France.

The quality of the balloon team which America sent this year to Switzerland is a brief that it will give the other competitors a hard fight for the landing place.

The Russia Report

THE report of the Russian team of inquiry into the accident to the Army airship *Ross*, which is reproduced in full in this issue, is nevertheless regarding the actual cause of that disaster. This was more or less to be expected owing to the rivalry with which the Russes went to destruction, for this precluded them on board to ascertain what went wrong while observation on the ground was mostly estimated and so their impressions only possess relative value. This seems to justify the report in stating that "it will never be possible to ascertain with absolute accuracy the cause of this accident."

However, the report recommends a number of safeguards which, had they existed on the *Ross*, might have prevented the accident. These safeguards are: (1) The use of helium instead of hydrogen; (2) The use of a master switch governing the entire power plant; (3) Detachable fuel tanks, controllable from the navigating room; (4) Emergency ballast releases in sufficient quantity to counteract an accidental drop; (5) Airships should be flown at such altitude that any driving tendency may promptly be stopped by discharging ballast.

Report on Accident to the Airship Roma

Official War Department Report Fails to Determine
With Absolute Accuracy the Causes of the Accident

In making public the report of the Chief of Air Service on the Roma disaster, the Secretary of War desires it to be understood that this is not a matter of controversy between the American and Italian governments. All the facts reported with the accident will never be determined to a certainty. The separate conclusions are the result of a sincere and careful investigation by the representatives of both nations and are both worthy of consideration. The report follows:

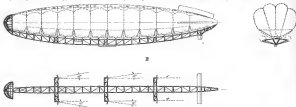
On Feb. 21, 1922, the new rigid warship Roma crashed to earth and was totally destroyed. This accident cost the lives of thirteen officers and sixteen men of the Air Service and five civilians. Of those on board the Roma at the time there were eleven survivors, all of whom were more or less seriously injured.

The Investigation

Immediately after the accident a Board of officers, consisting of Maj. Davenport Johnson, Maj. John H. Frost, and Maj. Joseph T. McFarney, all of the Air Service, was ap-

pointed. The Board of Aeronautics, Navy Department, who considered it together and submitted their joint conclusions. Comdr. J. C. Henshaw, Chief of the National Service, Bureau of Aeronautics, Navy Department, submitted a list of questions, considered the survivors' testimony and histories the report of the Board, and furnished in writing his own conclusions. Lieut. R. E. Hanson of the Fourth Naval District, Naval Academy, Annapolis, Md., in the report of this office made an investigation of the wreckage of the Roma and observed considered the report of the Board. Edward Scholzinger and Dr. W. H. Blanton, the latter a German lighter-than-air expert temporarily in the United States, went to the scene of the accident, examined the wreckage, questioned a number of witnesses, and finally advised testified before the Board of Officers. The report of the Board was further considered by various officers in this office.

In several cases those who had access to the report of the Board asked for additional information, which was furnished. All of these comments and opinions and the report of the



Approximate outline drawings of the U. S. Army warship Roma

pointed to make a thorough investigation and submit a report including all of the evidence taken and the resulting conclusions therefrom. The first meeting of the Board was at the scene of the disaster at 4:30 p. m., Feb. 23, 1922, and while the bodies of those who had lost their lives were being removed from the wreckage. The Board obtained evidence from all of the survivors and from a number of other persons who had seen the Roma in flight before any trouble developed and while the airship was descending. All told, the Board assumed and received the testimony of fifty witnesses. The investigation made by the Board was extremely painstaking and scrutiny of its report indicates that all available information was thus obtained and made a matter of record.

In order to secure additional and independent opinions concerning the cause of the accident, the report of the Board was submitted to a number of persons whose training and experience enabled them to formulate opinions which are entitled to much weight. Among them were Lieut. Col. A. Graham, the Italian Air Attache at Washington, who went to the scene of the accident, interviewed a number of witnesses himself, and who was given every facility to conduct an independent investigation.

The report of the Board was forwarded to G. W. Lewis, Executive Officer of the National Advisory Committee for Aeronautics and Harry Truman, Aeronautical Engineer,

Board, testimony, and all exhibits were then sent to the Air Service Engineering Division, at McCook Field, for study and for a further report. Thus every possible effort was made to secure unbiased opinions upon which reliable conclusions might be based.

The report gives here a brief statement regarding the principles and constructional features of the various types of airships and proceeds as follows: *Excerpt.*

Constructional Features of the Roma

The Roma was a semi-rigid airship, in fact, the largest of the type which has been constructed to date. Its gas-containing envelope consisted of a large fabric bag divided in eleven main compartments by intervening fabric partitions.

As hydrogen gas, used in airships, reacts quickly to changes in atmospheric pressure or temperature, with resulting expansion or contraction, there were provided in the lower part of the envelope six air compartments, or ballasts, one to serve each of the two adjacent gas compartments. Scoops outside the envelope admitted air into the ballasts, whenever the gas pressure was so low as to require it, to maintain the shape of the envelope.

The ball was attached to a steel keel consisting of twenty-five panels, each about 20 ft. in length. In cross section the width and depth of the keel varied from the maximum about

the fifth of the distance from nose to tail, to the smallest dimensions at the ends. The maximum depth of the keel was about 17 ft.; the maximum width at the top about 14 ft. The center of the keel was at the bottom.

At the forward end of the keel there was provided a portable framework, usually known as the "headrest" or "nose cage," to prevent the buckling of the envelope, due to air pressure.

Along the interior of the keel there was a network of truss bars to assist. In addition there was an external cage for passengers and a cabin for the navigation personnel of the airship. There are no masts, distributed in pairs along the keel and fastened to struts which obtained their support from the keel proper. These engines were arranged so that the propellers might not be in the slip stream from the engines in front of them.

All controls are provided with rigid horizontal stabilizer surfaces over the tail, the purpose of which is to check quickly any unusual tendency of the ship to rotate longitudinally or laterally. In addition, there are provided rudders to direct the lateral motion, and rudders to alter the inclination of the keel to the horizontal when it is desired to rise dynamically or to effect a landing.

These rudders of the Roma consisted of a lee-side lee stabilizer attached to the tail and of the keel. There were movable vertical surfaces, the operation of which could be controlled from the navigator's cabin in the center of the na-

The semi-rigid warship Roma was designed, constructed, and tested in Italy. The research began Aug. 28, 1919, and was completed in March, 1920. The airship was purchased from the Italian Government by the United States and three officers and the related crew of the United States Army were sent to Italy to participate in test flights and to be present during the dismantling, packing, and shipping of the Roma in order to familiarize themselves with every detail of its construction. The parts of the airship were designed to maintain sustained streams at a speed of 75 m.p.h. with a factor of safety of six. The designed maximum speed was 125 k.m.p.h. (77.67 m.p.h.). The contract maximum speed was 110 k.m.p.h. (68.34 m.p.h.).

The airship was re-assembled and re-tested at Langley Field, Va., during September, October and November, 1921. Test work and subsequent flights in the United States were conducted solely by personnel of the Air Service, American Army. Rigid inspections of the entire airship were made before, after, and during every flight in the United States.

On two such flights the vertical stabilizer had been slightly damaged due to a difference in gas pressure in compartments No. 39 and 41, but this damage had been repaired. The keel near its forward end was slightly damaged while the Roma was moored at Bolling Field, Washington. This damage had also been repaired. Certain other minor repairs, affecting



Photo U. S. Army Air Service

The U. S. Army warship Roma

ship by means of cables. There were other movable parts also operated from the navigator's cabin, which functioned as "up-down surfaces." This rubber structure was 55 ft. long, 30 ft. high and 8 ft. wide. The "up-down surfaces" or elevators had a total number of about 650 sq. ft.; they were of the balanced type; in order to keep them in, or restoring them to a horizontal position there were rubbers, the tension upon which was regulated by counterweights. These rubbers were attached at one end to the elevators and at the other to non-movable parts of the rubber structure.

The supporting struts of the Roma contained instruments for detecting temperature and barometric changes, and others were provided to regulate the pressure of the gas in each compartment of the envelope. The pressure might be adjusted through the manipulation of the air scoop control valves. Small cables were provided for transmitting measurements to the engine in the case of each of the engines. There was no master control, by which the navigator could control or regulate the engines.

The Points Beyond Doubt

The following facts have been well established and concerning them there is no disagreement on the part of any who have investigated the accident or considered the report of the Board:

no way the structural strength of the Roma was made from time to time at Langley Field, Va.

On Feb. 21, 1922, about 2:30 p. m., the Roma while on a trial flight being newly installed Liberty motors, crashed to the earth and was destroyed by fire at a point east of Washington, Va. 3, and in a triangle formed by a railroad near South Street and Cipp Street, Quartermaster Intermediate Depot, Norfolk, Va.

Upon leaving the ground near the hangar at Langley Field, Va., about 1:45 p. m. on Feb. 21, 1922, the Roma rose steadily to a height of about 280 ft. and on an even keel. During the flight the Liberty motors functioned properly. The rear pair ran at 1100 r.p.m., the center pair at 1250 r.p.m., and the forward pair at 1180 or 1200 r.p.m. The weight of the Liberty motor installation was somewhat less than the Italian models, which they replaced. The power exerted by the Liberty motors during the flight was no greater than that which had been developed on other occasions by the American motors.

During the flight and prior to the accident, the Roma answered to its controls more readily than on any previous flight in this country, due no doubt to the sustained high speed. At no time during the flight of Feb. 21, 1922, was there an abrupt change in altitude or direction, on the con-

some of which were on the Boms, should be installed to allow any changes of trim and to overcome sudden static loads of altitude.

With or without such buffer releases, if there had been a sudden stall, by which the Boms could have been stopped all of its motion instantly, it is also probable that even from this low altitude the Boms might not have reached to the ground. The fact that when she struck the two aircraft engines were reversed at several speeds, but not being throttled down, was certainly partly responsible for the rigidity with which she reached the earth and for the resulting crash.

In the limited time at their disposal between the beginning of the dive and the crash, the officers and crew of the Boms did all that was in their power to prevent the accident. Down to the low altitude at which the Boms was flying, the time between the beginning of the dive and the crash was too short.

The loss resulting from the crash may be attributed to one or two causes. It is not known whether the gasoline (the engine fuel) or the kerosene (the engine oil) tank had been ignited first. The fire which had been caused when the forward engine, which were running, struck the ground, just as the Boms was sometimes named as airplane crashes. The gasoline may have been ignited when the Boms was in the forward engine's view. It is also possible that the kerosene may have been thus ignited before any gasoline fire occurred.

In addition to other precautions which should be taken when other engines are built, it is possible that the fuel tank, which should be detachable and provision made by which they should be dropped instantly by the officer in command.

Calculating the loss of life in the accident would not have been in great if the supporting medium in this service had been a non-combustible, non-explosive gas such as helium. In addition to the safety measures indicated above, the accident shows clearly that in all future airplanes at least, whenever possible, helium should be used in place of hydrogen.

All of the testimony concerning the disaster and all of the comments thereon were freely shown to the Italian Air Staff, a thoroughly competent expert, who stated that with our aid. It set forth most clearly the views of the Italian designers and builders of the Boms, made available to the staff of the most of their calculations and presented their opinions concerning the causes of the accident. All of these data received the most careful and sympathetic consideration in the office.

A Non-Comment Opinion

In justice to these Italian designers and builders of the Boms it must be said that they do not consider fully with the explosives and combustibles given above. Their reasons for this non-consideration are as follows:

The drawings of the Boms show that any one in the cabin could not see from the window or from the cockpit that part of the foot between the second and third sections of the nose which is said to have buckled. Any buckling of the foot would have caused the rear compartment to be damaged and the drill wires, which were fixed to the envelope, to be torn loose. No witness on the ground saw any buckling and consequent release of the envelope from the rear.

Captain Thoms had been in the cockpit and the envelope appeared to him to be in a normal position. The envelope's control had been handled very gently and the pilot at no time was required to balance a strong tendency to dive by any abnormal position of the elevator as would cause a buckling of the foot.

No matter how great the downward pressure on the fastened nose might have been, the force on the elevator could not have been greater than that which would have caused the envelope to be pushed in a rubber movement of more than 30 deg. from neutral. It is possible that the pilot operating the "up-down" rubber controls did not place three rubbers in any abnormal position nor did he consider a downward tendency of the nose prior to the beginning of the dive.

All parts of the foot, of the rubber structure, and rubbers were calculated for a speed of 77 mph. with a factor of

safety of 2. Before assembly they were actually physically tested by subjecting them to double the maximum calculated strains. Furthermore, the transmission control cables, as is customary, were calculated to break at stresses lower than any which would cause damage to the structure.

The vertical force exerted by the elevator subjects the foot to a bending moment which is at a maximum in the middle section of the foot. Had the foot buckled or broken, it is not known where it would have broken, but the maximum force exerted against the foot was the same as that against the strength, compared with the calculated strains, is almost three times that of the middle section.

The control transmission cable was a continuous one. If the foot had buckled so severely as not to be discovered by witnesses on the ground, the pilot could still have maintained the rubbers by taking up the slack on the control cables. Furthermore, even if there had been a buckling of the foot, as it was as 7 deg. the cable would have been under only 5 in. of slack. The pilot could not have found the whole loss at this amount of slack would have been easily taken up. The normal run of the cable was 35 in. in each direction.

If there were a collapse of the nose, it is not understood why such trouble did not occur shortly after the start when the forward compartment had a lower pressure than after the air samples were replaced. The witness on top testified that the strutting on the nose was very little. The pressure in the first compartment was low, but never lower than 30 in. Had the nose collapsed the nose could not have escaped. Any downward tendency of the nose might have been due both to pressure on the tailer and to the pressure on the nose.

If there were a collapse of the nose, it is not understood why such trouble did not occur shortly after the start when the forward compartment had a lower pressure than after the air samples were replaced. The witness on top testified that the strutting on the nose was very little. The pressure in the first compartment was low, but never lower than 30 in. Had the nose collapsed the nose could not have escaped. Any downward tendency of the nose might have been due both to pressure on the tailer and to the pressure on the nose.

It would have been necessary for the elevator to rotate down many degrees in order to reach the position in which the effect of the elevator becomes nil. Buckling of the nose compartment would have been noted from the ground. It is to be noted that at the middle section the lower end of the nose sitting on the elevator is 150 ft. against the 150 ft. lower end of the nose carried on the cable. It is possible to prove by wind tunnel test that the bending moment due to a slight flattening of the nose cannot be great.

The Italian Engineers' Explanation

Based upon the ascertained facts and their study of the evidence, the Italian engineers offer the following explanation of the disaster:

Due to the high speed of the ship and to the overbalanced elevators, the modeling rubbers or "nose nose", which were probably over-stressed, broke suddenly. This caused a sudden stress upon the rubber cables and upon the other parts of the controlling mechanism causing the cables, at some part of the mechanism, to break. The "up-down" motion then became free and without the compensating effect of the counter forces they assumed their natural position. The equilibrium which would give control to the ship was lost and not less than 5 deg. to the elevator, as has been proven by recent tests in Italy. This caused an immediate upward motion of the nose part of the Boms and her consequent dive to the ground.

As the designers and constructors of the Boms are vitally interested in maintaining the facts, it is thought as soon as this fact is set forth their reasoning and the conclusions which they have reached on the reasons given above. The very short time which elapsed between the starting of the trouble and the crash, the death of those on board most competent to judge the many thoroughly ascertained with the structure of the Boms and to the fact that the nose was not broken, and to the force which had to be used in descending this debris in order to recover the remains of the victims.

Aeromarine Engine Passes 300 hr. Navy Test

Aeromarine Model U8D 200 hp. Engine is First to Pass Successfully New Exacting Endurance Trials

The Navy Department, Bureau of Aeronautics, has inaugurated new test conditions for several engines which mark a new step in engine development. In the past it has been the rule to prove new types of engines by a 50 hr. endurance test, run in 5 hr. periods. This test has previously been imposed on one of extreme severity and the few types that have successfully completed this period without major failures have been considered to have entirely proved their suitability for use.

Realizing that the next step in aeronautics is the development of engines of far greater durability, the Bureau has increased the length of their tests to six times the old standard.



Side view of the Aeromarine Model U8D 200 hp. engine which recently passed the difficult 300 hr. test of the Navy Department.

or 300 hr. This altitude had been set at the expectation that any existing engine would have been run to destruction before that length of time, so that the actual life could be determined.

The test to run in three main periods of 300 hr. each including all of the flying load, followed by 14 hr. of full throttle. After each 100 hr. the engine is put through a complete series of tests to check up horsepower, fuel consumption, etc., and is subjected to detailed examinations for wear.

The test is by far the most exacting which any government has yet demanded in determining the life of aircraft engines. Indeed, we believe that no government test of aircraft power plants conducted abroad exceeds 80 hr. It is therefore a particular source of gratification to be able to state that an American engine, the Aeromarine model U8D, has been the first successfully to pass the 300-hr. test of the Navy Department, making its full horsepower and functioning perfectly in all respects at the end of the 300 hr. test. The tests were, moreover, and all records checked and verified by Navy inspectors working in three 4-hr. shifts, for to get in 300 hr. working the standard 44-hr. week would have almost required three weeks.

The accompanying graph, showing the power curve of the Aeromarine U8D engine at the conclusion of the 300-hr. test, is reproduced from the graph annexed to the official Navy report. From the latter the following conclusions of the test will be of interest to our readers:

Conclusions of the Navy Report

"This engine as a whole, has a useful life in excess of 300 hr. without replacement or adjustment in any of the parts which affect the power output or the fuel or the oil consumption of the engine, which characteristics were maintained without falling off during the entire 300 hr.

"The condition of the entire valve mechanism including the driving gears and their bearings was reasonable. It was impossible to find any part of the valve mechanism where either a misalignment or excessive travel inspection would indicate a difference between the condition of the part and one that had merely run through a standard 4-hr. acceptance test. It is to be noted that during the entire test five only out of thirty-two valves were ground, on after 300 hr. This was done by way of precaution and after the last 100 hr. it was impossible to detect any differences in appearance between the valves and seats that had been ground and the others.

"The piston assembly and cylinder sleeves showed peculiarly no wear, neither the wrist pins nor the rings were removed during the entire run. All rings were kept over their entire surface and were free in their grooves. There was no evidence of burning on either the pistons or the rings. The amount of carbon was very small, and microscopic measurements showed no wear in the pistons after the first 100 hr.

"The new cylinder head gaskets were used throughout the



End view of the Aeromarine Model U8D 200 hp. engine.

test, the heads having been taken off and replaced twice during the test, 140 after the first and second hundred hours. No water leaks whatever were noticeable in the pistons or water joints (except hose connections) during the entire run."

"At the end of 300 hr. the oil pump assembly was in excellent condition, the oil pressure remaining constant throughout each run. The magnetic drive shaft and other accessories were still in splendid condition at the completion of the run.

"In order to bring every detail on the motor up to a life of 300 hr., the following changes alone are needed. Meticulous supervision of all the parts of the 300 hr. motor has failed to find any part of the motor which is to be made in the case of the motor being built now. This was done in the testing after 300 hr. of the motor. The only change which was made was to adjust the timing of the valves and the pump (which should have been

bring to light any further points at which improvements, from the standpoint of durability can be suggested.

(8) The connecting rod bearings were changed after 300 hr., due to cracked flakelike. It is thought that this was due to deflection of the bronze bush under load loads from the shank of the integral rod. Although 300 hr. is generally considered to be a long life for connecting rod bearings, future engines will have this rod and strengthened letter to distribute the loads over the surface of the bronze bush, which will be itself considerably strengthened to further cut down the deflection.

(9) The main crank bearing was in excellent condition after 300 hr., but the propeller and bearing was

cracks, however, did not spread during the subsequent 300 hr., during which the bearing was still used. These cracks are again attributed to deflection in the bronze shaft and to the bronze bush under load. It will be provided with stiffening ribs at each end.

(10) The crankshaft propeller thrust bearing distance piece (in the dotted line used in the test) is entirely satisfactory, and its failure during the current trials. On future engines, crankshafts will be so designed to entirely eliminate this distance piece, which will be replaced by integral shoulders. The greasing away of these distance pieces lowered the crankshaft assembly and caused trouble with propeller hubs and finally with the crankshaft.

(11) The driving connection between the magneto and starter drive shaft and the crankshaft gear train in the test after the electric starter had been used many times, and will be redesigned for future tests. This connection is satisfactory when only a hand crank is used.

"After from the foregoing details the entire engine was in excellent condition, the examination of all parts showing in general that where the wear was measurable it occurred in the first 100 hr., and that after the engine was completely worked in, the wear at all points appeared to be negligible.

"The average full throttle gas consumption was 6.450 ft. per horsepower per hour. The average oil consumption for the whole test was 0.0095 lb. per horsepower per hour. The average full throttle M.E.P. was 234 ft. per sq. in. (Computed)."

The following table gives the averages obtained from the log sheets during the 300-hr. test of the Aeromarine USD engine.

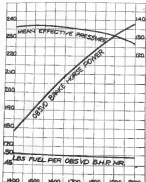
Characteristics of the Engine

From the accompanying illustrations it will be seen that in the present form the engine differs in some minor details from the original Aeromarine USD engine described in *Aviation* about a year and a half ago, at the time when it earned the standard 100-hr. test of the U. S. Navy. It was following the latter test, which the original engine passed with great ease, that some minor modifications were introduced in its design, and it is in this modified model which passed the 300-hr. test.

Its bearing are the condensed specifications of the engine.

CONDENSED SPECIFICATIONS OF AEROMARINE USD AIRCRAFT ENGINE

No. of cylinders	4	500 hp.
Rated (brake)	500	500
Compression	18 to 20	18 to 20
Stroke	10 in.	10 in.
Weight	1,000 lb.	1,000 lb.
Development	700 ft. lb.	700 ft. lb.
Weight of crank	100 lb.	100 lb.
Weight of connecting rod	10 lb.	10 lb.
Weight of piston	10 lb.	10 lb.
Weight of valves	10 lb.	10 lb.
Weight of crank and piston	120 lb.	120 lb.
Weight of piston and connecting rod	20 lb.	20 lb.
Weight of valves	10 lb.	10 lb.
Weight of crank and piston	120 lb.	120 lb.
Weight of piston and connecting rod	20 lb.	20 lb.
Weight of valves	10 lb.	10 lb.
Weight of crank and piston	120 lb.	120 lb.
Weight of piston and connecting rod	20 lb.	20 lb.
Weight of valves	10 lb.	10 lb.



Power curves of Aeromarine USD engine after completion of 300 hr. test

changed at 300 hr., and there were cracks in the flakelike of the front bearing after 300 hr. These

AVERAGES TAKEN FROM LOG SHEETS OF 300 HOUR ENDURANCE TEST ON AEROMARINE USD ENGINE

-30 to 300 hr.				-14 to 300 hr.			
300	300	300	300	300	300	300	300
MEP	BHP	MEP	BHP	MEP	BHP	MEP	BHP
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100
234	100	234	100	234	100	234	100

Some of the instruments and gauges and accessories are made, due to the fact that the Aeromarine USD engine is a completely standard engine in design, with the exception of the modifications made in the present form.

The average speed of the engine for the 300 hr. test was 1847. The average speed of the engine for the 300 hr. test was 1847. The average speed of the engine for the 300 hr. test was 1847.

The general design of the engine is such as to give a structure of the maximum rigidity, together with simplicity and long life of the working parts. A single casting forms the cylinder and water jackets. The detachable cylinder heads are aluminum castings and can be removed with valve gear intact, without disturbing the rest of the engine.

The cylinders are placed on either side of the engine above the engine bearers, and the exhaust pipes are between the two cylinder blocks. Exhaust manifolds can be furnished to lead exhaust at the center of the engine or toward the water-jacket and outward around the side of the cylinder block. Exhaust oil feed is supplied at important bearing parts by a ground oil pump in the pump. A large drain pump is provided to discharge oil from the pump into an outside tank, in case the dry-sump system is used. Ignition is by two Spindler magnetos operating independently.

The engine is fitted with a ground lead crank, which may be had with the Aeromarine lead-free release, if desired. Provision is also made for electric starting motor and generator. The propeller hub takes a standard size propeller, from 11.00 in. to 6.00 in. at 6,000 r.p.m.

One Synchroscopic Drive of an approved type can be supplied.

Aerial Trespassers Exonerated

Flying over land pointed against trespassers does not constitute a trespass, at least not under the Pennsylvania act of 1925, according to Judge Charles C. Carlet of Pennsylvania, Pa. He reversed the decision of Justice of Peace Korman of that city after the latter had found Harold G. Norn and Lena D. Smith, owners, liable for trespass.

The accident was well known to Korman and recently staged exhibition flights at the county fair grounds.

North, Norn and Cole obtained a landing field on a farm near Pennsylvania. O. F. Grise who owns a farm adjoining the landing field objected to their flying over his property and made application against them for trespass. At the hearing before the Justice of the Peace no evidence was produced that the airplanes had set foot upon his land. However, they admitted having flown over his property at various heights and it was upon the admission that Mr. Grise and his counsel treated upon a conviction. Cole was discharged but North and Norn were assessed \$1 each and costs.

Court representative North and Norn prepared a petition of appeal, which was presented to Judge Carlet. The appeal was allowed by the latter, who established a decidedly interesting precedent. It was maintained that the action was not properly brought in that they had not set a foot upon the ground of Mr. Grise and that the act, under which the infringement was made, had no provision for such a trespass as alleged in this instance.

The information against the three was made under the act of 1925, a general act, which forbids trespassing on land that is posted. No decision has ever been rendered in Pennsylvania as to trespass where only the air above posted property is involved.

In reversing Judge Korman's decision, Judge Carlet placed the costs of the initial hearing and appeal upon Mr. Grise. The costs amount to about \$100.

The testimony originally offered was to the effect that Norn had started his machine from the landing field and flew over the Grise farm at a height of about 50 ft. for a distance and then came to a height of about 350 ft. No testimony was offered to show that Smith had flown over the Grise farm.

The case is to be carried to the appellate court in Pennsylvania, assuming Mr. W. B. Adams, attorney for Mr. Grise. Mr. Adams stated that Mr. Grise has started the proceedings purely to ascertain the law in the case and the rights of landowners in relation to airplanes and other vehicles of the air. Mr. Adams is of the belief that Pennsylvania will soon make legislation governing the height at which airplanes, etc., may fly and he believes that this case will be largely instrumental in bringing about such legislation.

General Classification of Instruments

N.A.C.A. Report No. 125

This report (No. 125) of the National Advisory Committee for Aeronautics, by Henry D. Harvey, is intended as a technical introduction to the series of reports on aeronautical instruments. It presents a discussion of those subjects which are common to all instruments. In the first part, a general classification is given, embracing all types of instruments used in aeronautics. The second part of the report is devoted to a discussion of the various instruments throughout the reports in this series. It is given as a guide to the reader. Finally a classification is given of the various problems connected with the instrumented report and investigation.

In this way the following groups of problems are brought up for consideration. First, problems of mechanical design; second, human factor; third, manufacturing problems; fourth, supply and selection of instruments; fifth, problems concerning the technique of testing; sixth, problems of installation; seventh, problems concerning the use of instruments; eighth, problems of maintenance; ninth, physical research problems. This classification of instruments which are necessary to aeronautics in general serves to indicate the different points of view which should be kept firmly in mind in approaching the study of any particular instrument.

Kansas City Airport

Plans for an airport which will make Kansas City a leader in commercial aviation were announced June 30 by members of the Fiyah Club. A 50 acre field, which will be leased to the government and operated under supervision of Air Service officers, is being purchased by a group including Eugene A. Barker, Fred H. Hays, Robert L. Lester, Maj. Howard F. White and Eugene Youngman. Mayor Wehrle, who supervised the construction of Hazelton (now Curtis) Field at Garden City, will be managing director of the Kansas City airport.



Illustration (National Photo)

The Fokker Model F7F torpedo bomber (400 hp. Liberty) now being experimented with at Annapolis naval air station

Description of the Hannover Glider

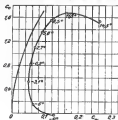
Interesting Particulars of the Glider Which Made
4½ Mile Cross Country Flight in 15 min. 40 sec.

The Hannover glider in which *Ardur Martens* made the longest flying flight in the second class section, and on which he subsequently flew across country a distance of 4½ miles in 35 min. 40 sec., was built to the design of Dr. G. Madsing by members of the flying club of the Hannover technical high school. The aerodynamic properties and behavior of the machine were investigated by the Göttingen Laboratory.

The Fundamental Points

In the construction of the Hannover glider the following main points were considered fundamental:

(1) From the aerodynamic viewpoint it was desired to obtain the smallest possible rate of descent. A high lift coefficient, high aspect ratio, reduction of parasite resistance, and a



Polar diagram of the Hannover glider. $C_L = 4\pi V$; $C_D = 4\pi V^2$ (German absolute units).

particularly suitable form of fuselage were selected for this purpose, giving an L/D equal to 35, that is, a gliding angle of 1 in 35.

(2) From the viewpoint of state requirements, lightly and reasonably spaced loads of possibly varying magnitude were sought.

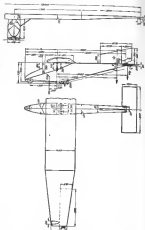
(3) Constructively great simplicity and ease in assembling and disassembling was desired.

The general appearance of the Hannover glider, and its principal dimensions may be gathered from the accompanying outline drawings, in which the dimensions are given in millimeters. Constructed in English units, the principal characteristics of the machine are: span 41 ft. 6 in., chord midlength 4 ft. 9 in., chord at tip 2 ft. 6 in., mean aspect ratio 1.16, total wing area 172 sq. ft.

How the Wings are Built

The monoplanes wing is built in three sections, namely a center section 21 ft. 9 in. by 4 ft. 9 in., and two outer panels of decreasing chord as shown in the outline drawings. The center section is set at 4 deg. incidence and has a uniform profile which varies but slightly in depth, while in the outer panels both the thickness of the wing and the incidence decrease toward the tip.

The wing is built up around a main spar of 1 section and



Outline drawings of the Hannover glider (Dimensions in millimeters)

lattice construction which is located in the center of pressure line. The dimensions of this spar were determined with a view of the shocks the machine has to absorb on landing when the wing tips turn over on the ground. For this reason the main spar was given a safety factor which in no case is less than 5, and which in some places is 33. By a suitable curvature of the spine the weight was correctedly kept within a narrow limit. In connection with this over the front third of the wing was constructed as a tapered resting tube, a result which was obtained by covering this part of the wing with plywood, which gives it in all parts a safety factor of at least 5.5. This construction, because considerable rigidity and resistance to deformation, and affords at the same time a smooth and light leading edge, thus ensuring the permanency of the machine's contour.

The main wing ribs are spaced 18 in. apart, and are designed to withstand flying loads up to 46 kg./sq. m. (9 lb./sq. ft.). To take care of the different flying stresses, secondary

(ditch) ribs are built into the leading portion of the wing, one of which extends aft to the trailing edge, to ensure the symmetry of the contour. The portion of the wing which is not stressed with plywood, is covered with fabric.

The wing is stressed to the fuselage by means of three bolts. One of these bolts passes through a steel fitting which runs the span in the center, and connects it with a counter-pressure fitting mounted on the upper centerline longitudinal of the fuselage. At the rear of the wing two fittings mounted on the main ribs connect them to vertical struts of the fuselage. The fittings and bolts are of acrylic propylene to insure rigidity, and are so constructed as to permit of the wings being shifted back or forward a distance of 8 in. By the means of it is possible to equalize differences in the weights of the respective pilots in the machine can be flown without shifting the longitudinal trim, or requiring a special setting of the elevator. Although the wing and fuselage fittings are of acrylic propylene for all stresses that may occur, it was considered advisable to brace the wings to the fuselage by means of four sloping struts. These serve merely the purpose of

taking up the lateral shocks which may occur on landing when the machine rolls over onto a wing tip.

Special care was taken in the design of the fittings which connect the control surfaces with outer panels, so as to insure absolute rigidity in severe landing shocks and in dives. For this purpose the ribs connecting at the end of each surface (center and outer) are reinforced, and the relative part is connected by means of three bolts, one at the leading edge, and one each at the upper and lower flange of the fuselage spar. These bolts as well as those of the main wing fittings are quickly removable and may be inspected through little trap doors. Repairs and assembly are thus greatly facilitated.

All parts are of the non-bellied type, each having an area of 88 sq. ft., and are controlled by ropes.

The construction of the fuselage follows fairly orthodox lines, consisting of wooden longitudinal and cross-pieces, fabric covered. Unusual, however, in the landing gear, which consists of three fork-like spheres which are allowed to rotate in suitable sockets.

Dutch Instrument Competition for Fog Flying

The national committee of the Royal Dutch Aero Club will hold a competition for the advancement of the safety of instrumental aviation, with particular regard to landing in fog. Following are the rules of this competition:

Prizes

1. The chief prize of F. 3000.—(Three thousand guilders) will be awarded to the person, that uses the best apparatus (instrument or set of instruments), with which in an air plane, flying in a dark fog, the height above the ground or the surface of the water can be measured.

The conditions are as follows:

- The indication must take place independent:
 - (a) of any installation on the ground or on the water;
 - (b) of the atmospheric pressure.
- The cause of the indication may:
 - (a) not exceed 1 meter on a height below 10 meters;
 - (b) not exceed 10 per cent of the true height at an altitude between 10 and 500 m.
- The indication, as to nature and value, must take place in an airplane, of which the velocity has:
 - (a) a horizontal component of 10 to 50 meters per second;
 - (b) a vertical component of 5 to 10 meters per second.
- The competition is open to competitors of all nationalities.
- Not later than March 15, 1923, the following documents must have reached the Jury, who consists as undersecretary the Officer of the Royal Dutch Aero Club, Heterogracht No. 10, The Hague, Holland:
 - (a) A sealed envelope, outwardly marked by a word or a device with an address for correspondence, containing the name and the address of the competitor.
 - (b) Description of the apparatus, accompanied by drawings or photographs, which must be enclosed at the latest twenty pages quarto typewritten and 5 sq. in. drawing, threshold.
 - (c) The Dutch, French, German or English languages may be used.
 - (d) A proposition of the competitor for the method of testing his apparatus.
 - (e) A declaration of the competitor, renouncing all claims for damages and engaging himself to defend from any action of the government.
 - (f) A declaration of the competitor, that he is willing to send his apparatus to the Jury for testing within thirty days after the request of the Jury has been sent to the address for correspondence.
 - (g) The Jury is empowered as follows:
 - Dr. N. B. Wolf, Director of the Aeronautical Institute of the Dutch Government; president of the Jury.

Dr. J. M. Bregman, professor at the Technical University, Delft.

Colonel W. G. van Nieuwen, Naval Flying officer.

Capt. F. A. van Hest, Army Flying officer.

Dr. C. Schoute, Sub-Director of the Royal Dutch Meteorological Institute.

Dr. J. B. Staphorst, Chief Engineer of the Technical Service of the Dutch Army Flying Corps.

J. Tegenbos, Head of the Technical Service of the Navy Flying Corps.

Dr. G. van Nieuwen, Sub-Director of the Aeronautical Institute of the Dutch Government; secretary of the Jury.

The Jury may, if necessary, consult other authorities or institutions. The duties of the Jury shall be decided by majority of votes, when votes are equally divided, the President decides on the question. The Jury decides about the admission of the instruments to be sent in.

In case of non-attendance the competitor will be notified accordingly, the Jury not being obliged to give any reasons.

In all cases the Jury decides on the highest result. The Jury has the right to divide the prize, to advance it, to withhold it or to award it wholly or partly, even if the conditions, mentioned in par. 1, are not strictly fulfilled.

The Tests

V. The Jury decides about the method and about the place, where the tests are to be held. The instruments must also be tested during flight.

At the request of the competitor the Jury may allow the tests to take place outside the Dutch Kingdom under the supervision of a competent body, who must be approved by the Jury. The costs must be paid by the competitor.

The competitor may attend in the tests and at the request of the Jury render assistance.

VI. The Jury may, at its discretion, and at the request of the competitor, examine the property of the competitor. When the tests are finished, the instruments will become the property of the Royal Dutch Aero Club. The Jury and their advisers are bound to observe the beginning of the tests; at the Jury and their advisers however do not take any responsibility for damages resulting from any publication, the Jury advises competitors to apply for a patent for their inventions before sending the instruments to the Jury.

VII. The Jury will send the tests, if possible, within three months after receipt of the apparatus.

VIII. The Jury will send to the results with explanatory notes in the following papers for publication. The apparatus will be sent back to the competitor and the award will be distributed to the winner within one month after this publication.

IX. In case of doubt the Dutch text of these rules will be binding.

New York to Brazil Flight

A flying boat trip from New York to Rio de Janeiro, Brazil, with an intermediate flight to the Amazon, involving a total of nearly 8500 miles, is being planned by Walter Rinton, one of the pilots of the U. S. Navy flying boat XG-1, under the banner of Transatlantic Flight, and Dr. Eustachius Peter Martins, of Pernambuco, Brazil. The latter will be co-pilot and navigator, and John Witherspoon, navigator.

The Curtiss H-16 flying boat (25-400 hp. Liberty engines) with which the trip is to be made has been acquired from the supply stock of the Navy, and is being fitted out at the Naval Aircraft Factory at Philadelphia. Various changes have been incorporated in her structure. The hull has been reinforced on the bottom, and new types of insulation and propulsion are being fitted. The hull has been named the "Championa Corona," after the president of the Brazilian Aero Club.

Following is the tentative schedule of the flight, with the approximate distance in nautical miles: New York to Charleston, S. C. 600 nautical miles; to St. Thomas, P.R. 400; to Port-au-Prince, Haiti, 470; to San Juan, P.R., 420; to Port-de-Paix, Martinique, 390; to Port of Spain, Trinidad, 300; to Georgetown, British Guiana, 390; to Paramaribo, Dutch Guiana, 270; to Para, Brazil, 540; to Manaus (up the Amazon) and return, 1000; to Macapa, 120; to Amapa, 420; to Natal, 200; to Pernambuco, 750; to Recife (Pernambuco), 420; to Bahia, 390; to Rio de Janeiro, 734. The arrival at the latter city is scheduled to coincide with the inauguration of the World's Exposition celebrating the centennial of Brazil's independence.

Locating Lost Lakes

Locating and photographing inaccessible lakes in the national forests of Alaska are the latest work to which the airplane has been put, according to the Forest Service, Department of Agriculture.

It has long been known that there are many lakes on the headlands and islands traversed by the route passage between Seattle and Sitka, but they did not appear on any map. During the New York-Natal flight made by Army aviators, later frequently sighted lakes could be found on the island and most authentic maps of the territory. Tales of unknown water bodies are constantly being brought in by trappers and prospectors. Less than a year ago a lake 6½ miles long and 1½ miles wide was discovered at the head of Short Bay. The lake has over 1000 acres of surface area and is less than 1½ miles from Sitka, but because of the surrounding country's rough topography has remained unknown and unexplored.

Recognizing that many other of these "lost lakes" may be sources of valuable water power, the Forest Service has laid plans to map the western end of the north by means of aerial photography. A few days' flight, it is said, will be sufficient to cover the area with a degree of accuracy that would require many years and great expense to accomplish by ordinary methods. The work, which has been approved by the Federal Forestry Commission, will be done by aviators, flying from Kodiak, Alaska.

Indianapolis Offers Help

Since the outbreak of the railroad strike the Postmaster General has received innumerable offers from private sources volunteering automobiles, trucks and airplanes to keep the mails going. These offers have been the subject of long deliberations to the Postmaster General, who in personal communications has already expressed his appreciation of this display of patriotism and of loyalty to the Government.

The latest offer, made at the War Office Department in the form of the Aero Club of Indianapolis. The club has six airplanes ready to take to the air on a moment's notice to deliver the mails. The Indianapolis organization includes the 40th Pursuit Squadron, Captain James Weaver, having pilots, mechanics, maintenance of way specialists and field messengers prepared for instant service.

Cincinnati Airport

The following additional information regarding the Cincinnati airport has been received from the Cincinnati Chamber of Commerce.

Realizing the strategic point offered by the geographical location of Cincinnati and its relative position, namely, the hub of the west, on the eve of which are located various other flying States, the project of the Chamber of Commerce appointed an Aviation Committee to make a survey of local territory and to select the best possible site. They were also organized in this work by the presence of the War Department to furnish inquiries and other necessary assistance for the establishment of an air squadron O.R.C. Their progress resulted in the organizing of the 100th Pursuit Squadron O.R.C., whose permanent quarters of Cincinnati airport.

The field which has been selected, consists of 100 acres, more or less, and is located as follows: 15 miles from the center of the city (Post Office) on the main line of the C. & A. Railroad and immediately north on Blue Ash, the C. & A. Railroad and immediately north on Blue Ash, the C. & A. Railroad at the location of the field. The field is reached from the city by three highways; namely, Madison Road through Middletown, Reading Road through Reading, then on our Cooper Avenue, and by Montgomery Road through Norwood. At the present stage, the ground upon the field is available for landing purposes, and is marked with a white cone, 30 ft. by 30 ft.

The plans are that the field will be dedicated sometime in August, when Capt. Edgar R. Schneider will fly from Detroit and thence, by way of Camp Goodhue, Louisville, McCook Field, Dayton, and from the Fifth Army Corps, Columbus, Ohio. It is probable that a building and operating company will be formed at a later date. In the meantime, the field is open to all types.

The rest of the field will amount to over 500,000 sq. ft. of which has been put in and the balance is being raised by the Chamber through public subscription.

Aircraft for Rumania

John T. Keros, royal consul of the Rumanian government, 3525 Broadway, New York, (Columbus 6786) has applied to the American Chamber of Commerce for authorization and price covering airplanes, engines and equipment suitable for freight and passenger carrying lines which are to be furnished by the Rumanian government. Mr. Keros states that financial arrangements are to be made by the Danubian Corporation through the Irving National Bank, New York. Mr. Keros is interested in the Danubian Corporation, an American company which has offices in the Woodstock Building, New York. He states that up to \$250,000 is available for the purchase of flying equipment.

Mr. Keros explains that the transport situation in Rumania is critical. Railroads are inadequate. Buses, the rapid, but slow twenty-five miles inland from the Black Sea ports. It is the intention to establish several lines radiating from Bucharest, one to Odessa at Kustendy, and northward toward Ukraine, and another clear to the Hungarian frontier to connect with existing trans-European train service which is very unsatisfactory.

Aircraft Appropriations, 1922 - 23

The following items were appropriated for Aviation for the fiscal year 1922-23.

Air Mail	\$1,800,000
Army	12,800,000
Navy	14,500,000
N. A. C. A.	210,000

\$29,310,000

Trade Notes

It has become evident more and more during the past year that aviation needs to be given much more substantial support and financial work. Recognizing this, The Glenn H. Martin Co. has expended into a program of this nature and has very naturally enlarged its activities and facilities for such work. Its engineering and research departments are now larger than at any time in the history of the company.

The work of these departments embraces both the military and commercial phases of aeronautics and the progress being made promises most apparent and revolutionary also in advanced types of commercial and military craft in the near future.

Ernest T. Kroff, chief test engineer for the Goodyear Tire and Rubber Co. leaves next week for Philadelphia, where he will spend some time at the naval aircraft factory going over the car layout for the new Z-1C.

That Goodyear intends to maintain its position as the foremost manufacturer in the light-air field, is evidenced by the importance attached to research and development work as evidenced by the eleven months, Charles E. Cummings, Army Development Engineer at Goodyear visited July 8 for Europe in the interest of his company. Mr. Cummings will visit England, France, Germany, and Italy, where he will visit the latest developments in aeronautics.

Arrangements will be made shortly of the result of arrangements made by Goodyear in applying asked by an aircraft company to develop aircraft prototypes. Their aircraft system have been experimenting for some time on this with successful results.

The latest type of Ferman Cuba Hydroplane, which is described on this page, carries five passengers and makes a speed of 45 to 50 m.p.h. drawing only 1 in. of water. The

glider is propelled by a 100 hp. Renault motor and air propeller. The Ferman company has also developed a "fishy glider" which is proving very popular abroad. Two such "fishy" may be seen in the accompanying illustration, along on the Lake Raron, near Paris. These little boats weigh only 200 lb. and draw 1 in. of water. They are propelled by a 50-12 hp. Anzani motor and air propeller, which gives them a speed of 18 m.p.h. Both types of hydroplanes are sold in this country by Wallace Robert Co., Inc., Wallace 844, Philadelphia.

Captain Amundsen's J-1 all-metal monoplane, with which he plans to make a dash over the North Pole, is completely equipped with Flanigan instruments. These include two compasses, speed and drift indicator, air speed indicator, turn indicator and bank indicator. All of these instruments are the products of the Flanigan Instrument Co., of Brooklyn, N. Y. The largest manufacturers of aircraft instruments and equipment in the United States. Captain Amundsen expressed himself as being greatly pleased with the apparatus he was able to secure, as these American instruments are much better than anything of the kind he had seen abroad.

Henry Voisin, of Chicago, American representative of Luftschiff-Zeppelin, states that they are building a small Zeppelin of 30,000 cu. m. hydrogen capacity. This ship is for their own use, and is being built for the following reasons—1. They want to get "nipples in the air" instead of merely doing a lot of talking as some of their competitors are doing. 2. They want to make a lot of experiments with the view of completing research work done during the years of interruption of construction work forced upon them by the attitude of the Allied and Associated Powers. 3. The ship will be used as a training ship for the crew necessary for the Spanish-Argentine War. They expect to have the ship finished during the winter 1932-33.



Three Ferman baby gliders in a race on the river Raron, near Paris. Below: The latest type of Ferman Cuban glider, which accommodates six passengers.

Landing Field Information

Native to Aviation No. 5 (1932)

The following landing fields have reported to the Office of the Chief of Air Service:

California

Alpine—Emergency; situated on Yanga Mountain.

Del Mar—Good field on soft sands.

Palmdale—Field on Edwards Mountain; poor.

Pomona, Beaumont, Norwalk, San Luis Rey, Colton and Warner Springs—Emergency; no data.

Colorado

Illinois

Round Grove—Seventy-seven miles from Irem City on Chicago & North Western Railroad. Field one-half mile south of railroad station; supplies available.

Streator—Permanent field near Rock River, near U. S. Government dam. Two other fields in vicinity; supplies available.

Maryland

Fredrick—Good emergency landing at Rose Hill Manor.

Springfield—Springfield Trunk Air Line Station. Good new field.

Massachusetts

North Carverton—Duxton Field; one-half mile northwest of city, 25 acres, was first.

Nebraska

Beatrice—Emergency, 10 acres, square, no obstructions.

Omaha—Albion field 1930 by 3000 ft. Wet in long heavy silt; June city on narrow strip available.

New Jersey

Hightstown—Pasture, good at all times; 2000 ft. square.

Howe Valley—Incised field, operated by the Central East Airlines Co., 1200 feet by 1200 ft. Partly dry after rain.

Two locations; supplies available.

Port Jervis—Eighty-seven and one-half miles from Manassas on the Delaware, Lackawanna & Western Railroad. Good field; supplies available. Near Morris Canal and railroad water lock.

New York

Cornwall—Landing field being constructed at junction of Champlain River and Port Creek, opposite railroad bridge.

Waterville—Emergency field; pasture, good landing.

North Carolina

Camp Green—Seaplane only, United States Coast Guard and local vision.

Chapel—Emergency landing only.

Perly Mount—Field 1 mile north of town, smooth and well drained, 2000 by 700 feet.

North Dakota

New Salem—Kenner Ferry, 165 acres, square, good and good drainage; supplies.

Ohio

Ancrum—Miami Valley Air Co. Field and Flying School.

Pennsylvania

Prudfoot—Emergency Airfield, 1500 by 200 ft., 1 mile from city. Wind cone, hangar, supplies available.

Pittsburg—Good field at West Pittsburg.

Tort—Four miles east of York on Lancaster Highway and intersection line, 1200 by 2200 feet.

Tennessee

Topshamville—Emergency, no data.

Texas

Cameron—Cameron Airport; approximately 445 by 108 yd., hard surface, good drainage, 1 mile from town.

Dallas—Good field, used by Air Service during war.

Virginia

Berryville—Emergency field east of town.

Fredericksburg—1930 ft. by 300 ft., on Potomac River between Oregon and Cherry Hill.

Manassas—Roughed field; good in any weather; 800 by 300 ft.; 1 mile from town.

Washington

Freemont—Southwest corner of city along railroad tracks; excellent field.

Oakbrook—Three miles east of city; excellent field owned by the Lutz Aviation Company; hangar and supplies on lot.

West Virginia

Capon Bridge—Field at foot of Capon Mountain. Good field, well drained.

Greenville—Two fields on Ohio River near town. Another field 1 mile south of Harford City, 600 by 1200 ft., land well drained.

White Sulphur Springs—Golf course at hotel available for landing at any time.

Wisconsin

Madison River—Smooth field on prairie clear of obstructions. Wind cone at east end and west end. South of Union Falls; tracks and new small hangar. Available the year round.

Rock River—Good field west side of Union Pacific tracks, distinguished by large washboards over railroad tracks. No gas; difficult to be available.

"Propulsion Efficiency vs. Performance"

Editor, Aviation—

In the issue of Aviation dated July 19 you appeared a section by Arkhivskii titled of our article "Propulsion Efficiency vs. Performance". Mr. Arkhivskii points out that our numerical example does not agree with the data which he presents applying to the D134.

In checking Mr. Arkhivskii's calculations we find that he has made a slight error. The power loss of the theoretical machine based on his assumptions should be 573 instead of 540 and the per cent increase in pay load should be 36 instead of 25 in "maximum horsepower" over our figure. Mr. Arkhivskii did not notice that most of the discrepancy between 52 per cent gain as indicated by our example and the 37 per cent gain as indicated by his example is due to the difference in the weight of fuel and oil consumed. The D134 has oil and fuel consumed for the London to Paris route which is a much shorter distance than the average modern light transport of the commercial airplane, particularly in this country. Just as it is important to us to know the propulsion efficiency of an engine in increased to also does propulsion efficiency. Using the data given by Mr. Arkhivskii for the D134, the per cent increase in pay load has been calculated for various conditions, assuming that the propulsion efficiency was increased by the ratio of 36/75. Tabulated results are given below.

Weight of Fuel and Oil (lb. per hr.)	Endurance at Present Power (Hours)	Endurance at Increased Power (Hours)	Increase in Endurance (Per cent)
100	1.0	1.36	36
150	1.5	2.04	36
200	2.0	2.72	36
250	2.5	3.40	36
300	3.0	4.08	36
350	3.5	4.76	36
400	4.0	5.44	36
450	4.5	6.12	36
500	5.0	6.80	36
550	5.5	7.48	36
600	6.0	8.16	36
650	6.5	8.84	36
700	7.0	9.52	36
750	7.5	10.20	36
800	8.0	10.88	36
850	8.5	11.56	36
900	9.0	12.24	36
950	9.5	12.92	36
1000	10.0	13.60	36

Estimated for a one-stop flight from New York to Chicago, the D134 would be able to carry about 60 per cent more by load with its present performance if the efficiency could be increased by the ratio of 36/75.

The D134 undoubtedly does represent a more efficient machine both structurally and aerodynamically than the one assumed in our discussion of "Propulsion Efficiency vs. Performance". The aerodynamic efficiency may be fairly attributed to the use of a mixed motor, which type is strongly recommended in our article. It will be noted that our example was given to represent average present day motor rather than the best modern type which Mr. Clark shows the D134 to be.

RAY G. MILLER
F. E. SULLIVAN, JR.

Seaplane Mail for New Orleans

Seaplane mail service at New Orleans will be established soon, according to an announcement given out by the Post Office Department. In line with the policy to speed up mail at the chief American ports. The plane will catch outgoing steamers with late mail and bring in mail from the steamer half of a day ahead of time.

ARMY AND NAVY AIR NEWS

Air Service

Albany 12 to Night Flight over New York.—The Army aviator Lt. Capt. William E. Rogers, A. S., on command, made his night flight July 27-28. Leaving at station at Albany, Md., at 5 p. m. the ship made a round trip to New York, which it reached in the middle of the night, and was back again at Albany at 5:30 the next morning. The weather was fair.



General Peened, Chief of Air Service, and Captain Rogers, who commanded the service. 12 during her night flight.

Just ahead for such a trip, for wind, fog and showers made navigation difficult, particularly in the neighborhood of New York.

The 12 was sent back over Trenton, N. J., and on coming the report by the lights of New York were visible from 80 ft., but they failed to make a landing. Over the battery the ship descended to about 400 ft. and was jerked up by a 600-600,000 pounds power under overhauled about the Perry Hydroplane Co. had stationed them at the suggestion of the Aeronautical Club of Commerce. A dozen men were distributed over Manhattan and Brooklyn, but the weather was so bad that the 12 was unable to pick them up and abandoned its attempt to pass over the city at an altitude of 500 ft. The ship was over New York for about an hour and a half before it started on its return trip.

Inside Captain Rogers, in command, the crew of the 12 consisted of Lieut. G. Harris and E. S. Moon, and Regt. A. D. Albrecht. In addition, three news association men and a photographer were carried on board.

Air Service Reserve, 5th Corps Area.—With commissioned personnel assigned and attached to 25 of the Air Service units of the 5th and 16th Army Corps, work is now going forward upon the planning of the individual officers in flight and on jobs in line with their previous experience, and in the preparation of colored men for the different assignments.

Activity has been resumed from the Fifth Corps Area command, the sending of 400 officers and 300 enlisted men to the Southern Training Camp at Camp Meade, Ky., between July 15 and 30. Of this number the Air Service units will be represented by 60 officers and 30 enlisted men, and special orders are being made to have that list include representatives from each unit represented at present.

Major Henry J. F. Miller, A. S., who has been placed in charge of Air Service reserve activities in the Fifth Corps Area, states that the value of having the Air Service units a representative gathering is obvious, that if we get into officers and one related man from each individual organization to attend the Training Camp, then have them attached to the field for training, with the opportunity to get what they all want—"a chance to take the air again"—and some work in shooting trouble on the field line, a good start will have been made toward the achievement of the ultimate aim of the Organized Reserve—active training as a unit with full strength in reconstituted and colored personnel.

Lt. Col. Mowbray, a long Green County flight—Fort Leoni, C. C. Mowbray, the winner of the first Pulitzer Trophy race, in 1920, recently had the distinction of aviating in Berlin, during breakfast at Washington, D. C., standing at Dayton again, being at Baltimore, Iowa, his home, at Washington, D. C., for the night at Rockville, Md. The total distance of 1380 miles was covered by Lieutenant Mowbray, in a T-1048, on 14 by 30 miles. The day, which had his machine with him, left McCook Field at 14.00 m., landed at Washington at 5:10 a. m. and his breakfast there while his plane was being moved. Leaving there without delay, he was back in Dayton for lunch at 3:30, where more gas was taken on, and he left for Rockville, Iowa, where he landed at 7:00 p. m. He had produced on a win in French Williams, proprietor of the field. At 8:35 p. m. Lieutenant Mowbray took off once more, and landed at Chamblee Field, Rockville, Md., at 8:25 p. m.

Forest Fire Patrols to be Organized.—Army airplanes which in the past few years have been instrumental in saving the government thousands of acres of valuable forests by the quick discovery of forest fires, promptly reporting them by radio to forestry bureau officials and rushing them to instantly available measures to combat them, are now being organized into forest fire patrol units. Due, however, to the lack of personnel, it will only be possible to patrol the forests in the State of Oregon.

The devices to inaugurate the service patrol this year was worked out at a conference between General Patrick, Chief of Air Service, and the Secretary of War, and telegraphic orders have been sent to the Air Officer of the Ninth Corps Area at San Francisco, Calif. to inaugurate the patrol at once. The George post, which was conducted by the Air Service, stationed from Casey Field, Cal., and Mother Field, Calif. Seven pilots and twenty enlisted men have been assigned to this work, and seven airplanes will be used. It is anticipated to conduct this patrol for a period of six days.



Model 22, U. S. Navy

The Curtiss Model 22 combat plane, fitted with a 200 hp. Lawrence radial engine, built for U. S. Naval Aviation.

Death of Capt. Thomas H. Shaw.—On the afternoon of Saturday, June 17, Capt. "Tommy" Shaw, of the Second Group (Bombardment), who went from Kelly Field to Ellington Field to ferry back an SEA, crashed on the airfield some 100 feet after taking off. Captain Shaw was instantly killed and the ship burned.

The following tribute to the deceased officer is paid by the Kelly Field correspondent of *Air Service News Letter*:

"The death of Capt. Thomas H. Shaw at Ellington Field on June 17 has cut the entire Bombardment Group into sorrow. An Executive Officer of the Field he rendered loyal help to every officer and enlisted man of the command by his untiring helpfulness in times of difficulty, his ready smile and word for each of us, and his enthusiasm flying activities. Even before reporting over his assignment to us as Commanding Officer of the English Squadron, had won the esteem of his entire staff while taking off as an SEA at Ellington Field brought our men of happiness. Although he had been flying for little more than a year, his love of the game kept him in the air even on his leisure, and he was considered one of the most capable and fearless pilots on the Field. After transferring to the Air Service, Captain Shaw served in the Infantry of the First Division, and had been decorated for gallantry in France. The passing of this brave life leaves to us all great satisfaction of knowing that he died as he lived: 'Fare, a MAN, always a true soldier, he left us with his boots on.'"

Naval Aviation

Tests of Combat Plane.—A shipplane that is designed to meet every requirement of combat and permit in connection with fleet operations, is at present under test at the American Air Station, under the supervision of the Bureau of Aeronautics of the Navy Department. Present indications are that the plane will develop characteristics equal for combat work in an land plane in general use by the military services and in addition to this the features which render it perfectly adaptable to ship use are incorporated in this new design. The plane is a Navy design built at the Naval Aircraft Factory in Philadelphia.

Another plane of the same type has recently been completed by the Curtiss Company at Garden City, L. I., and will shortly be flown to Anacostia for further tests. This machine is illustrated above.

With the development of aircraft aviation to a point where they are now recognized as an essential arm of the naval force, it has been necessary to look for the solution to the problem in producing suitable designs of aircraft to operate from the carriers. These problems in a few words included the following questions: How could aircraft of the various types and possessing the following qualifications: (a) Best performance (b) Greatest radius of action (c) Greatest maneuverability (d) Most adapted to handling and storage on board ship, and operating from a ship or an airfield.

The TB, as the new plane has been designated, is now built, has demonstrated all of the above qualities in a manner extremely satisfactory to government experts, and it is expected that quantity production on this type will go ahead within the next future.

It is not claimed that the TB is superior to any fighting plane in the world, but government experts connected with the Bureau of Aeronautics state that it is the equal of any craft of its kind in standard use. The plane is equipped with a Lawrence 200 hp. air cooled motor which is the highest powered air-cooled motor built in the country. The construction of the wings is such as to permit of rapid assembly. The struts which connect the upper and lower wings are secured in place with pins which are quickly withdrawn so that the plane can be disassembled quickly and carried in the smallest possible space on board aircraft carrier. This feature will also enable the heaviest possible number of machines to be placed on board.

A standard equipment of two types of landing gear is provided, namely: wheels for landing on the deck of carriers or on land, and skis for landing on water. Both types of landing gear will be supplied so that the rapid conversion from landplane to seaplane may be effected.

The Navy Sales Bulletin.—The U. S. Navy Central Sales Office, Navy Yard, Foot of 4th St., S. E., Washington, D. C., sends every Monday a bulletin for the convenience of prospective retail users, correspondents, officers and others interested in purchases of supplies from the Navy.

Catalogs or any of the other listed may be obtained from any of the following offices: Supply Office at Navy Yards, Philadelphia, Pa.; Charleston, S. C.; Boston, Mass.; New York, N. Y.; San Francisco, Calif.; Pearl Harbor, Hawaii; Norfolk, Va.; Naval Training Station, Great Lakes, Ill.; Roanoke, Va.; Naval Air Station, Naval Supply Depot, Brooklyn, New York; Naval Sales Representatives, 234 Westminster Bldg., Chicago; Room 302, Shopping Bldg., 45 Broadway, New York.

Wind Indicator at Arlington.—The Bureau of Aeronautics, Navy Department, has arranged for the installation of wind recording devices on the 708 ft. radio tower at Arlington for the benefit of aviation.

A mast has been erected on the tower equipped with a 6 ft. wind vane and a non-inclined anemometer. A shaft connected to the vane will turn a disk which will have electric contacts running to a recorder in the transmitting station arranged automatically to record the wind direction every minute. The anemometer will have two circuits, one for transmitting index of wind to the recorder, and one running to a buzzer which will indicate the wind velocity whenever a breeze is present; the number of buzzer repeated per minute will indicate the rate that the wind is blowing.

The light recorder as it is called will also make a continuous record of sunlight. The anemometer transmitter will be placed near the wind vane and will indicate on the recorder every minute of daylight sunlight that strikes the top of the tower.



Official Photo of L. H. May

Secretary of the Navy, standing next to a large model of a ship.

The purpose of the machine transmitter is to show on the recorder whether or not there is sunlight above a fog that would be prevailing over the ridge and note in the vicinity of Washington.

At present, in order to get the wind velocity and direction at considerable distance above ground small balloons inflated with hydrogen are floated and bearings on them taken, with anemometer engines are obtained with a theodolite such means, which, when plotted, will show the speed and direction of the currents that drifted the balloons. The balloons are usually inflated so that they will rise at the rate of 300 meters per minute, and when the sky is clear they can be followed to heights of 18,000 ft. or over and the air currents determined at that way. However, there are times when fog, low clouds, rain or mist interfere with the observation of pilot balloons, so that the observations of having wind instruments on high towers become important. Questions of wind direction and velocity from the Arlington Radio Station will be of great benefit in aviation throughout this territory. Arrangements will be made between the Bureau of Engineering and Bureau of Aeronautics, Navy Department, shortly prior to call up the Arlington Radio Station and get the wind velocity and direction at any time, for flight purposes.

Deck Landing Experiments.—For the past few months the Naval Air Station at Hampton Roads has been the scene of heretofore most experiments having to do with the landing of airplanes in a space that will represent the limits of the deck of a carrier. A wooden platform 100 ft. in length and 30 ft. wide has been constructed, equipped with a number of sliverings wires to which weights were attached while the ends of the wires overhang the platforms.

Longlines of the platforms were stretched over wires to the guide a plane used it had landed on the dummy deck. The naval planes at the station manned by pilots who will fly from the carrier have been engaged in previous landings on the deck and in the light of past few months' experiments the device has been perfected so that it is now adapted to use on shipboard and will enable the safe landing of any type of plane equipped with landing gear to use in the Navy.

To land a plane on the dummy deck the pilot comes in low and close to the edge of the platform, as if a hook impinged from the bottom of the plane engages the instrument wires on the deck. The successive wires are then picked up, and the increasing amount of weight attached to the wires exerts a braking effect on the speed of the plane and it is brought to rest within the space of a distance measured in feet.

Naval Orders.—Lieut. Hugo F. A. Baile (N.C.), det. Nav. Air Sta. San Diego, Calif. to duty U.S.S. Nemo.

Lieut. (j.g.) Carl Schmitt (C.C.), det. Office of Gen. Inspector of Naval Aircraft, Eastern District, Garden City, L. I., to Friedrichshafen, Germany.

Lieut. Richard E. Byrd, det. Sea. Navigation, to Sea. Administration.

Ensign John P. Carston, det. Nav. Air Sta. Pensacola, Fla., to U.S.S. Harriet.

Naval Corps Orders.—First Lieut. Clifford Pritchard, det. Nav. Air Sta. Pensacola, Fla., to S.G.B. Hampton Roads.

See. Lieut. John G. Channing, det. Nav. Air Sta. Pensacola, Fla., to Marine Barracks, Parris Island, S. C.

See. Lieut. John N. Smith and Sec. Lieut. Goodwin W. Kirkham, det. Marine Barracks, Quantico, Va., to 1st Air Squadron, M. C. Santa Domingo.

Coming Aeronautical Events

AMERICAN

Date Aviation Meet, Aircraft Exhibition and Aeronautical Congress, Chicago

Oct. 7—Detroit Aerial Derby Derby, Detroit (Central Marine Flying Trophy Competition).

Oct. 15-16—Detroit Aerial Derby, Detroit (Pulitzer Trophy Race).

FOREIGN

August—Cape August Schindler (Schindler speed race) Naples, Italy.

August—Tyrone Trophy (International Sloop Competition) Naples, Italy.

Aug. 6-28—Sailing and Gliding Competition, German-Farwest, France.

Aug. 23-24—Sailing and Gliding Competition, Cardiff, Germany.

September—Grand Prix of India (International Aircraft Competition) Allahabad, India.

Sept. 23—Cape Fureur Duval de la Wurde, (Aircraft speed race) France.

November—Aeronautical meet, if conducted, to be held about Aug. 25, at Mitchell Field, L. I.

October—International Farnham Competition, Rome, Italy.

Foreign News

Colombia—Colombia is considered to be ahead of other South American countries in civil aviation, and the latest developments confirm this view. Since the beginning of September, the German-Colombian Aviation Co. established a regular service for mail and passengers along the following route: Barranquilla-Quindío-Nariño and Barranquilla-Cartagena. Other routes are under consideration. Five machines are employed in the El Dorado Magdalena, covering in 7 by the distance which usually takes ten days by steamer and rail.

During September last, two airplanes covered 4,950 miles in 11 flights, transporting 27 passengers and four tons of mail and goods. In October, these machines covered 9,614 miles in 67 journeys with 87 passengers and 54½ tons of goods. In November, four machines covered 125 flights, transporting over 10,254 miles and carrying 126 passengers and just over 14 tons of goods. The figures for December were 94 flights, distance covered, 50,254 miles, 63 passengers and 9 1/2 tons of goods. The total flights for the first four months of 1931 were 367, miles covered, 34,550, mails and parcels, tons, covered, 26 1/2 and passengers carried 363.

The above figures clearly show the progress of civil aviation in Colombia. In the nation concerned not a single accident has been registered. In Mazatlan, Medellin, Cali and Paoli, Bolivia, French and Colombian aviators frequently give regular flights, and all the principal towns are maintaining schemes for regular aerial transport. Before the end of this year, it is expected to have a complete net of aerial routes. The great grid and platform system of the country will then be able to serve two or three times in the convenience of their valuable mails to the coast.

The Government has a Military Aviation School under French tuition, and considerable progress has been already attained by the Colombian pilots.

Holland—An international aeronautical exhibition will be held in Rotterdam under the auspices of the Royal Netherlands Aero Club during the first two weeks in September. Exhibitors and visitors from all over the world will be invited to this exhibition which will be known by the initials I.C.A.R. The city of Rotterdam has secured a large amount of money on its airport, which is now considered the best equipped in Europe. The city is cooperating in every way to make the aeronautical exhibition a success, and to this end is making arrangements to grant a subsidy and also participate in the government expenditure.

Spain—Failing to obtain the necessary grant for the development of her Air Service, Spain is holding a million dollar lottery as an alternative method of getting things aerial going. Fifty thousand pounds will be distributed as prize money, and the air service will benefit by the same amount. The prize will be £10,000.

Spain's air force consists of 135 airplanes and a staff of 656. There are five airfields and 25 grassed landing places in the country.

Norway—The Norwegian government, in a decree recently made public, recognizes the importance of Norwegian civil aviation. These consist of the automatic mark "N" and a registration number, both of which appear on the sides of the fuselage (or hull) and on the wings of airplanes, and on either side of the nacelle of free balloons and airships. However, these aircraft will be required to display the Norwegian merchant flag painted on both sides of the rudder.

Italy—Under the recent regulations scheme adopted for Italian aerial aviation, three classes of heavier-than-aircraft will be specialized: for combat and military aviation, for flying boats, will be for mail and passenger service. (1200 hp) P.R.B. flying boat. It is possible that land machines will also be used for coastal work.

Where to Fly

CALIFORNIA

SAN FRANCISCO, CALIFORNIA
EARL P. COOPER AIRPLANE & MOTOR CO.

ALABAMA

PARTRIDGE, Inc.
Aeronautical Instruction
Aero Club of Illinois Mail Address:
Field, Chicago, Ill. 426 S. Michigan Ave.
Write for Brochure

ARKANSAS

One of the largest and best equipped flying fields in the United States
KOKOMO AVIATION CORP.
Lafayette, Ark.
ALL TYPES OF CURTIS PLANE.

MARYLAND

Lagan Field, 3 miles S. E. of Baltimore
All branches of Commercial Aviation.
Shops, Hangars and efficient Field Service
AMERICAN AIRCRAFT INC., Station 7, Box 366, Baltimore, Md.

MICHIGAN

AEROMARINE AIRWAYS, INC.
Only service to Cleveland
MEMORIAL PARK & RIVER
ON RIVER
12 Passenger Flying Coaches

MINNESOTA

WHITE BEAR LAKE, MINN.
City of White Bear Lake, Minn.
Harold G. Peterson Aircraft Company
SCHOOL OF AVIATION

NEW JERSEY

NEW YORK AIR TERMINAL
New Jersey - 8 miles from Times Square.
Largest shops that cannot be equal. Please contact 126, Jr.
CHAMBERLIN AIRCRAFT
Hartford, Hartford, N. J.

NEW YORK

CURTIS FIELD, GARDEN CITY, LONG ISLAND
KINGSTOWN FIELD, SUNFORD, N. Y.
FIVE STAR SERVICE, GARDEN CITY, N. Y.
CURTIS AIRCRAFT & MOTOR CORPORATION

NEW YORK

AEROMARINE AIRWAYS, INC.
Times Building, New York
12 Passenger Flying Coaches & passengers, open and enclosed flying boats. Sighting Tents - flights to three and Lake Resorts.

OHIO

AEROMARINE AIRWAYS, INC.
Only service to Cleveland
D & C CO., 1000 E. 10th St. ST. CL.
CLEVELAND
12 Passenger Flying Coaches

OHIO

DAYTON, OHIO.
Supplies, Repairs, Storage and Field - Mile from Dayton Tech.
JOHNSON AIRPLANE & SUPPLY CO.

WISCONSIN

CURTIS-WISCONSIN AIRCRAFT CO.
FLYING SCHOOL
Milwaukee Air Port
GILES & HEDERMEIER
NEW CLING, Wis. Milwaukee, Wis.

NEW YORK

If you are one of the thousands in your state being told that facilities for passenger carrying, plane, sailing and other flights, you should be represented in WHERE TO FLY each year.

26 Consecutive Insertions \$20.00



Photo by Goodyear News Service

The latest addition to U. S. Army
Complete floor mounted, 120 ft. long
and has a cruising velocity of 40
m.p.h., or 45 miles per hour.



The Goodyear AC— A New Type, Non-Rigid Dirigible

Test flights proved that the unusual contour of the Goodyear A.C., best described in "Squid," was fully justified—the lift of the ship was remarkable, her speed was most satisfactory.

Concerning the varnish protection given various surfaces of the ship against weather, its makers, the Goodyear Tire and Rubber Company, have this to say:

"Our experience with Valpar on previous ships we have built made us select it for the latest Military Airdrop just adopted by the government. Valpar has these qualities of durability and flexibility we look for in choosing a varnish for airdrop work.

"Army and Navy Specifications call for

"Valpar" or "Biquel," and we consider "Valpar" to be the best varnish for this work. In our long experience as pioneers in the building of airdrops for both branches of Government Service we have never had a varnish defect, and we attribute that to our use of "Valpar."

Valpar was used on the fins of the Goodyear A. C. and on the exterior and interior of the car, including the aluminum tanks, the fixed and movable control surfaces, instrument board and all metal parts. Durable, waterproof, flexible—Valpar protects wood and metal surfaces from water and weather, vibration, heat and cold.

If there's a surface to be varnished—use Valpar.



VALENTINE & COMPANY

Largest Manufacturers of High-grade Varnishes in the World
All Varnishes also

New York Chicago Boston Toronto
London Paris Amsterdam
W. F. FULLER & CO., Pacific Coast

EDWARD P. WARNER

Consulting Aeronautical Engineer

Mass. Institute of Technology
Cambridge, Mass.

CLASSIFIED ADVERTISING

35 Cents a word, including change. 25¢ per month in advance. Address replies to two columns east AVIATION 201 Fourth Ave., New York.

FOR SALE: DH-4—ONE motor, had short 42 hours. Fine looking ship. New last year and completely rebuilt. Had 3 passenger job. Must be seen to be appreciated. Please only privately. Send cash, make offer. J. F. Bender, 35 St. Pauls Place, Brooklyn, N. Y.

FOR SALE—Patent on an aerial camera mount. Is useful to make good aerial pictures. Patent No. 1,423,364. Address: J. Skaggs, H. Q. Co., 13th Engineers, Camp Humphreys, Va.



LEARN TO FLY

Learn to fly in the oldest and most successful commercial aviation school in America.

Many Dugan graduates are prominent aviators.

The Dugan school has its own field, seven type planes, complete instruction, license and license.

Students free of cost to fly. Send for free brochure. Fully licensed flying school.

Courses include: emergency landing in flying, ground work, assembly, wireless, aerial photography, field management, etc.
The Ralph C. Dugan School of Aeronautics
Dept. 18 140 N. Dearborn St. Chicago, Ill.

Just off the Press

THE FIRST ANNUAL EDITION OF

Who's Who in American Aeronautics

It contains 1000 biographical sketches, numerous photographs and a great deal of information of permanent reference value not heretofore brought together. The table of contents includes the personnel of:

State and Municipal Aviation Commissions
Army Air Service
Navy Bureau of Aeronautics
Air Mail Service
National Advisory Committee for Aeronautics
Officers and Committees, Aero Club of America
Aeronautical Chamber of Commerce
Manufacturers Aircraft Association
Aircraft Underwriters' Association
American Aeronautics' Safety Code
Advertising Section

An advertising section thoroughly representative of the aircraft industry — manufacturing, sales and operations — will prove a valuable feature.

ONE DOLLAR PER COPY

THE GARDNER, MOFFAT CO., Inc. 225 4th AVE., NEW YORK

INDEX TO ADVERTISERS

A	
Aeronautics Engineering & Sales Co.	143
Aircraft Service Directory	179
B	
Beech Aircraft Co.	241
C	
Cox-Klemin Aircraft Corporation	169
Curtis Aeroplane & Motor Corp.	171
Clanfield Advertising	285
D	
Daguer Wright Co.	147
Dugan School of Aeronautics	168
F	
Fokker	165
H	
Huff Daland Aero Corporation	169
J	
Johnson Airplane & Supply Co.	167
L	
Lary, James, Aircraft Co.	167
Larock Standard Aircraft Corporation	166
Lopes, Floyd J.	165
M	
Martin, The Glenn L. Co.	145
N	
New Jersey Travel Co.	169
Northrop, Martin A.	267
P	
Packard Motor Car Co.	173
R	
Rocking's, John A., Sales Co.	247
T	
Thomas-Morse Aircraft Corp.	149
Thurston, W. Harris, & Co.	147
V	
Valentine & Co.	249
W	
Warner, Edward P.	249
Wellington, Sears & Co.	247
Werns to Fly	244



THE WISE PILOT

Buys the PETREL because he can get it in and out of small fields more safely; because it goes faster and better on a gallon of gas; and because its rigid design withstands wear and tear better, and its simple construction methods cut its maintenance costs in half.

ASK US WHY

PETREL
"Master Aircraft"

Sales Territory Still Open

HUFF DALAND AERO CORPORATION

1918 Commerce Bldg. KANSAS CITY, MO.

M. F. FLYING BOATS

We have purchased from the Navy all the remaining MF Flying Boats, 57 in number. We have sold 17 in a few weeks.

These are new, unfallen and in perfect condition:

Prices from July 1st are:

MF without engine. Each Philadelphia or Pennsylvania, Pa. and Maryland Flying Boat is \$107.00

MF, two engines with 120 H.P. 6000 motor installed, ship completely ready up and ready for flight. Each College Point, L. I., N. Y. is \$200.00

MF, converted to three engines, mounted with 120 H.P. Motors. Each College Point, L. I., N. Y. \$200.00

Cox-Klemin Aircraft Corporation

College Point, L. I., N. Y.

(opposite from Pennsylvania Bldg.)

Telephone: Flushing 4127

THE Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES

Air Speed Indicator

PIONEER INSTRUMENT COMPANY
MAIN OFFICE AND FACTORY BROOKLYN N.Y.
WASHINGTON D.C. BUREAU SAN FRANCISCO
345 FIFTH AVENUE, 27 BROADWAY ST. NEW YORK, 222 FIFTH STREET

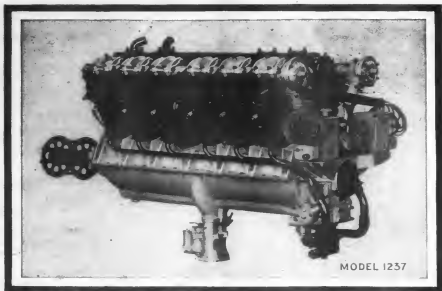


WRITE FOR OUR
SPECIAL PRICE LIST
CANUCK, JN., AVRO
AND OX-5 PARTS

ERICSON AIRCRAFT LIMITED
100 KING ST. EAST, TORONTO, CANADA

FIVE-PASSENGER BREGUETS

REPAIRS ON CURRENT MOTORS
Breguet 500 cc Motor per Hour, High Speed 120, 150, 180, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480, 500, 520, 540, 560, 580, 600, 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860, 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1160, 1180, 1200, 1220, 1240, 1260, 1280, 1300, 1320, 1340, 1360, 1380, 1400, 1420, 1440, 1460, 1480, 1500, 1520, 1540, 1560, 1580, 1600, 1620, 1640, 1660, 1680, 1700, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980, 2000, 2020, 2040, 2060, 2080, 2100, 2120, 2140, 2160, 2180, 2200, 2220, 2240, 2260, 2280, 2300, 2320, 2340, 2360, 2380, 2400, 2420, 2440, 2460, 2480, 2500, 2520, 2540, 2560, 2580, 2600, 2620, 2640, 2660, 2680, 2700, 2720, 2740, 2760, 2780, 2800, 2820, 2840, 2860, 2880, 2900, 2920, 2940, 2960, 2980, 3000, 3020, 3040, 3060, 3080, 3100, 3120, 3140, 3160, 3180, 3200, 3220, 3240, 3260, 3280, 3300, 3320, 3340, 3360, 3380, 3400, 3420, 3440, 3460, 3480, 3500, 3520, 3540, 3560, 3580, 3600, 3620, 3640, 3660, 3680, 3700, 3720, 3740, 3760, 3780, 3800, 3820, 3840, 3860, 3880, 3900, 3920, 3940, 3960, 3980, 4000, 4020, 4040, 4060, 4080, 4100, 4120, 4140, 4160, 4180, 4200, 4220, 4240, 4260, 4280, 4300, 4320, 4340, 4360, 4380, 4400, 4420, 4440, 4460, 4480, 4500, 4520, 4540, 4560, 4580, 4600, 4620, 4640, 4660, 4680, 4700, 4720, 4740, 4760, 4780, 4800, 4820, 4840, 4860, 4880, 4900, 4920, 4940, 4960, 4980, 5000, 5020, 5040, 5060, 5080, 5100, 5120, 5140, 5160, 5180, 5200, 5220, 5240, 5260, 5280, 5300, 5320, 5340, 5360, 5380, 5400, 5420, 5440, 5460, 5480, 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5700, 5720, 5740, 5760, 5780, 5800, 5820, 5840, 5860, 5880, 5900, 5920, 5940, 5960, 5980, 6000, 6020, 6040, 6060, 6080, 6100, 6120, 6140, 6160, 6180, 6200, 6220, 6240, 6260, 6280, 6300, 6320, 6340, 6360, 6380, 6400, 6420, 6440, 6460, 6480, 6500, 6520, 6540, 6560, 6580, 6600, 6620, 6640, 6660, 6680, 6700, 6720, 6740, 6760, 6780, 6800, 6820, 6840, 6860, 6880, 6900, 6920, 6940, 6960, 6980, 7000, 7020, 7040, 7060, 7080, 7100, 7120, 7140, 7160, 7180, 7200, 7220, 7240, 7260, 7280, 7300, 7320, 7340, 7360, 7380, 7400, 7420, 7440, 7460, 7480, 7500, 7520, 7540, 7560, 7580, 7600, 7620, 7640, 7660, 7680, 7700, 7720, 7740, 7760, 7780, 7800, 7820, 7840, 7860, 7880, 7900, 7920, 7940, 7960, 7980, 8000, 8020, 8040, 8060, 8080, 8100, 8120, 8140, 8160, 8180, 8200, 8220, 8240, 8260, 8280, 8300, 8320, 8340, 8360, 8380, 8400, 8420, 8440, 8460, 8480, 8500, 8520, 8540, 8560, 8580, 8600, 8620, 8640, 8660, 8680, 8700, 8720, 8740, 8760, 8780, 8800, 8820, 8840, 8860, 8880, 8900, 8920, 8940, 8960, 8980, 9000, 9020, 9040, 9060, 9080, 9100, 9120, 9140, 9160, 9180, 9200, 9220, 9240, 9260, 9280, 9300, 9320, 9340, 9360, 9380, 9400, 9420, 9440, 9460, 9480, 9500, 9520, 9540, 9560, 9580, 9600, 9620, 9640, 9660, 9680, 9700, 9720, 9740, 9760, 9780, 9800, 9820, 9840, 9860, 9880, 9900, 9920, 9940, 9960, 9980, 10000, 10020, 10040, 10060, 10080, 10100, 10120, 10140, 10160, 10180, 10200, 10220, 10240, 10260, 10280, 10300, 10320, 10340, 10360, 10380, 10400, 10420, 10440, 10460, 10480, 10500, 10520, 10540, 10560, 10580, 10600, 10620, 10640, 10660, 10680, 10700, 10720, 10740, 10760, 10780, 10800, 10820, 10840, 10860, 10880, 10900, 10920, 10940, 10960, 10980, 11000, 11020, 11040, 11060, 11080, 11100, 11120, 11140, 11160, 11180, 11200, 11220, 11240, 11260, 11280, 11300, 11320, 11340, 11360, 11380, 11400, 11420, 11440, 11460, 11480, 11500, 11520, 11540, 11560, 11580, 11600, 11620, 11640, 11660, 11680, 11700, 11720, 11740, 11760, 11780, 11800, 11820, 11840, 11860, 11880, 11900, 11920, 11940, 11960, 11980, 12000, 12020, 12040, 12060, 12080, 12100, 12120, 12140, 12160, 12180, 12200, 12220, 12240, 12260, 12280, 12300, 12320, 12340, 12360, 12380, 12400, 12420, 12440, 12460, 12480, 12500, 12520, 12540, 12560, 12580, 12600, 12620, 12640, 12660, 12680, 12700, 12720, 12740, 12760, 12780, 12800, 12820, 12840, 12860, 12880, 12900, 12920, 12940, 12960, 12980, 13000, 13020, 13040, 13060, 13080, 13100, 13120, 13140, 13160, 13180, 13200, 13220, 13240, 13260, 13280, 13300, 13320, 13340, 13360, 13380, 13400, 13420, 13440, 13460, 13480, 13500, 13520, 13540, 13560, 13580, 13600, 13620, 13640, 13660, 13680, 13700, 13720, 13740, 13760, 13780, 13800, 13820, 13840, 13860, 13880, 13900, 13920, 13940, 13960, 13980, 14000, 14020, 14040, 14060, 14080, 14100, 14120, 14140, 14160, 14180, 14200, 14220, 14240, 14260, 14280, 14300, 14320, 14340, 14360, 14380, 14400, 14420, 14440, 14460, 14480, 14500, 14520, 14540, 14560, 14580, 14600, 14620, 14640, 14660, 14680, 14700, 14720, 14740, 14760, 14780, 14800, 14820, 14840, 14860, 14880, 14900, 14920, 14940, 14960, 14980, 15000, 15020, 15040, 15060, 15080, 15100, 15120, 15140, 15160, 15180, 15200, 15220, 15240, 15260, 15280, 15300, 15320, 15340, 15360, 15380, 15400, 15420, 15440, 15460, 15480, 15500, 15520, 15540, 15560, 15580, 15600, 15620, 15640, 15660, 15680, 15700, 15720, 15740, 15760, 15780, 15800, 15820, 15840, 15860, 15880, 15900, 15920, 15940, 15960, 15980, 16000, 16020, 16040, 16060, 16080, 16100, 16120, 16140, 16160, 16180, 16200, 16220, 16240, 16260, 16280, 16300, 16320, 16340, 16360, 16380, 16400, 16420, 16440, 16460, 16480, 16500, 16520, 16540, 16560, 16580, 16600, 16620, 16640, 16660, 16680, 16700, 16720, 16740, 16760, 16780, 16800, 16820, 16840, 16860, 16880, 16900, 16920, 16940, 16960, 16980, 17000, 17020, 17040, 17060, 17080, 17100, 17120, 17140, 17160, 17180, 17200, 17220, 17240, 17260, 17280, 17300, 17320, 17340, 17360, 17380, 17400, 17420, 17440, 17460, 17480, 17500, 17520, 17540, 17560, 17580, 17600, 17620, 17640, 17660, 17680, 17700, 17720, 17740, 17760, 17780, 17800, 17820, 17840, 17860, 17880, 17900, 17920, 17940, 17960, 17980, 18000, 18020, 18040, 18060, 18080, 18100, 18120, 18140, 18160, 18180, 18200, 18220, 18240, 18260, 18280, 18300, 18320, 18340, 18360, 18380, 18400, 18420, 18440, 18460, 18480, 18500, 18520, 18540, 18560, 18580, 18600, 18620, 18640, 18660, 18680, 18700, 18720, 18740, 18760, 18780, 18800, 18820, 18840, 18860, 18880, 18900, 18920, 18940, 18960, 18980, 19000, 19020, 19040, 19060, 19080, 19100, 19120, 19140, 19160, 19180, 19200, 19220, 19240, 19260, 19280, 19300, 19320, 19340, 19360, 19380, 19400, 19420, 19440, 19460, 19480, 19500, 19520, 19540, 19560, 19580, 19600, 19620, 19640, 19660, 19680, 19700, 19720, 19740, 19760, 19780, 19800, 19820, 19840, 19860, 19880, 19900, 19920, 19940, 19960, 19980, 20000, 20020, 20040, 20060, 20080, 20100, 20120, 20140, 20160, 20180, 20200, 20220, 20240, 20260, 20280, 20300, 20320, 20340, 20360, 20380, 20400, 20420, 20440, 20460, 20480, 20500, 20520, 20540, 20560, 20580, 20600, 20620, 20640, 20660, 20680, 20700, 20720, 20740, 20760, 20780, 20800, 20820, 20840, 20860, 20880, 20900, 20920, 20940, 20960, 20980, 21000, 21020, 21040, 21060, 21080, 21100, 21120, 21140, 21160, 21180, 21200, 21220, 21240, 21260, 21280, 21300, 21320, 21340, 21360, 21380, 21400, 21420, 21440, 21460, 21480, 21500, 21520, 21540, 21560, 21580, 21600, 21620, 21640, 21660, 21680, 21700, 21720, 21740, 21760, 21780, 21800, 21820, 21840, 21860, 21880, 21900, 21920, 21940, 21960, 21980, 22000, 22020, 22040, 22060, 22080, 22100, 22120, 22140, 22160, 22180, 22200, 22220, 22240, 22260, 22280, 22300, 22320, 22340, 22360, 22380, 22400, 22420, 22440, 22460, 22480, 22500, 22520, 22540, 22560, 22580, 22600, 22620, 22640, 22660, 22680, 22700, 22720, 22740, 22760, 22780, 22800, 22820, 22840, 22860, 22880, 22900, 22920, 22940, 22960, 22980, 23000, 23020, 23040, 23060, 23080, 23100, 23120, 23140, 23160, 23180, 23200, 23220, 23240, 23260, 23280, 23300, 23320, 23340, 23360, 23380, 23400, 23420, 23440, 23460, 23480, 23500, 23520, 23540, 23560, 23580, 23600, 23620, 23640, 23660, 23680, 23700, 23720, 23740, 23760, 23780, 23800, 23820, 23840, 23860, 23880, 23900, 23920, 23940, 23960, 23980, 24000, 24020, 24040, 24060, 24080, 24100, 24120, 24140, 24160, 24180, 24200, 24220, 24240, 24260, 24280, 24300, 24320, 24340, 24360, 24380, 24400, 24420, 24440, 24460, 24480, 24500, 24520, 24540, 24560, 24580, 24600, 24620, 24640, 24660, 24680, 24700, 24720, 24740, 24760, 24780, 24800, 24820, 24840, 24860, 24880, 24900, 24920, 24940, 24960, 24980, 25000, 25020, 25040, 25060, 25080, 25100, 25120, 25140, 25160, 25180, 25200, 25220, 25240, 25260, 25280, 25300, 25320, 25340, 25360, 25380, 25400, 25420, 25440, 25460, 25480, 25500, 25520, 25540, 25560, 25580, 25600, 25620, 25640, 25660, 25680, 25700, 25720, 25740, 25760, 25780, 25800, 25820, 25840, 25860, 25880, 25900, 25920, 25940, 25960, 25980, 26000, 26020, 26040, 26060, 26080, 26100, 26120, 26140, 26160, 26180, 26200, 26220, 26240, 26260, 26280, 26300, 26320, 26340, 26360, 26380, 26400, 26420, 26440, 26460, 26480, 26500, 26520, 26540, 26560, 26580, 26600, 26620, 26640, 26660, 26680, 26700, 26720, 26740, 26760, 26780, 26800, 26820, 26840, 26860, 26880, 26900, 26920, 26940, 26960, 26980, 27000, 27020, 27040, 27060, 27080, 27100, 27120, 27140, 27160, 27180, 27200, 27220, 27240, 27260, 27280, 27300, 27320, 27340, 27360, 27380, 27400, 27420, 27440, 27460, 27480, 27500, 27520, 27540, 27560, 27580, 27600, 27620, 27640, 27660, 27680, 27700, 27720, 27740, 27760, 27780, 27800, 27820, 27840, 27860, 27880, 27900, 27920, 27940, 27960, 27980, 28000, 28020, 28040, 28060, 28080, 28100, 28120, 28140, 28160, 28180, 28200, 28220, 28240, 28260, 28280, 28300, 28320, 28340, 28360, 28380, 28400, 28420, 28440, 28460, 28480, 28500, 28520, 28540, 28560, 28580, 28600, 28620, 28640, 28660, 28680, 28700, 28720, 28740, 28760, 28780, 28800, 28820, 28840, 28860, 28880, 28900, 28920, 28940, 28960, 28980, 29000, 29020, 29040, 29060, 29080, 29100, 29120, 29140, 29160, 29180, 29200, 29220, 29240, 29260, 29280, 29300, 29320, 29340, 29360, 29380, 29400, 29420, 29440, 29460, 29480, 29500, 29520, 29540, 29560, 29580, 29600, 29620, 29640, 29660, 29680, 29700, 29720, 29740, 29760, 29780, 29800, 29820, 29840, 29860, 29880, 29900, 29920, 29940, 29960, 29980, 30000, 30020, 30040, 30060, 30080, 30100, 30120, 30140, 30160, 30180, 30200, 30220, 30240, 30260, 30280, 30300, 30320, 30340, 30360, 30380, 30400, 30420, 30440, 30460, 30480, 30500, 30520, 30540, 30560, 30580, 30600, 30620, 30640, 30660, 30680, 30700, 30720, 30740, 30760, 30780, 30800, 30820, 30840, 30860, 30880, 30900, 30920, 30940, 30960, 30980, 31000, 31020, 31040, 31060, 31080, 31100, 31120, 31140, 31160, 31180, 31200, 31220, 31240, 31260, 31280, 31300, 31320, 31340, 31360, 31380, 31400, 31420, 31440, 31460, 31480, 31500, 31520, 31540, 31560, 31580, 31600, 31620, 31640, 31660, 31680, 31700, 31720, 31740, 31760, 31780, 31800, 31820, 31840, 31860, 31880, 31900, 31920, 31940, 31960, 31980, 32000, 32020, 32040, 32060, 32080, 32100, 32120, 32140, 32160, 32180, 32200, 32220, 32240, 32260, 32280, 32300, 32320, 32340, 32360, 32380, 32400, 32420, 32440, 32460, 32480, 32500, 32520, 32540, 32560, 32580, 32600, 32620, 32640, 32660, 32680, 32700, 32720, 32740, 32760, 32780, 32800, 32820, 32840, 32860, 32880, 32900, 32920, 32940, 32960, 32980, 33000, 33020, 33040, 33060, 33080, 33100, 33120, 33140, 33160, 33180, 33200, 33220, 33240, 33260, 33280, 33300, 33320, 33340, 33360, 33380, 33400, 33420, 33440, 33460, 33480, 33500, 33520, 33540, 33560, 33580, 33600, 33620, 33640, 33660, 33680, 33700, 33720, 33740, 33760, 33780, 33800, 33820, 33840, 33860, 33880, 33900, 33920, 33940, 33960, 33980, 34000, 34020, 34040, 34060, 34080, 34100, 34120, 34140, 34160, 34180, 34200, 34220, 34240, 34260, 34280, 34300, 34320, 34340, 34360, 34380, 34400, 34420, 34440, 34460, 34480, 34500, 34520, 34540, 34560, 34580, 34600, 34620, 34640, 34660, 34680, 34700, 34720, 34740, 34760, 34780, 34800, 34820, 34840, 34860, 34880, 34900, 34920, 34940, 34960, 34980, 35000, 35020, 35040, 35060, 35080



MODEL 1237

Freedom From Vibration

A Packard Aircraft Engine in flight is as smooth and flexible as a Twin-Six on the roadway below. Its perfectly balanced design provides an even flow of power, closely approaching that of a turbine.

PACKARD MOTOR CAR COMPANY, DETROIT, U. S. A.



PACKARD

Ask the man who flies one